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ABSTRACT

This is part one of two performance assessment resources booklets for Level II of the Intermediate Science Curriculum Study (ISCS). The two booklets are considered one of four major subdivisions of a set of individualized evaluation materials for Level II of the ISCS developed as a part of the ISCS Individualized Teacher Preparation (ITP) program. Each booklet is a teacher's handbook to be used in identifying the appropriate performance checks with which to evaluate each student. Each also indicates how to set up testing situations, correct responses, and give remedial help. This manual (part 1) covers the first six units of Level II (1-6) in 12 chapters. Each unit begins with a summary table that includes the objectives and performance checks of the unit. Immediately following each summary table comes the bulk of the resource material for each objective introduced in that unit. Suggestions of ways teachers can use the manual are also included. (HM)

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INDIVIDUALIZED TESTING SYSTEM

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Performance Assessment Resources

ISCS LEVEL II

PART 1

SE 028 470

SILVER BURDETT
GENERAL LEARNING CORPORATION
Morristown, New Jersey · Park Ridge, Ill. · Palo Alto · Dallas · Atlanta

INDIVIDUALIZED TESTING SYSTEM

ALL LEVELS	**Individualizing Objective Testing** (an ITP module) **Evaluating and Reporting Progress** (an ITP module)
LEVEL I	**Performance Objectives**, ISCS Level I **Performance Checks**, ISCS Level I, Forms A, B, and C **Performance Assessment Resources**, ISCS Level I, Parts 1 and 2
LEVEL II	**Performance Objectives**, ISCS Level II **Performance Checks**, ISCS Level II, Forms A, B, and C **Performance Assessment Resources**, ISCS Level II, Parts 1 and 2
LEVEL III	**Performance Objectives**, ISCS Level III **Performance Checks**, ISCS Level III, ES-WB, Forms A, B, and C WYY-IV, Forms A, B, and C IO-WU, Forms A, B, and C WW-CP, Forms A, B, and C **Performance Assessment Resources**, ISCS Level III, ES-WB WYY-IV IO-WU WW-CP

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FOREWORD

To implement an educational approach successfully, one must match the philosophy of evaluation with that of instruction. This is particularly true when individualization is the key element in the educational approach. Yet, as important as it is to achieve this match, the task is by no means simple for the teacher. In fact, without specific resource materials to help him, he is apt to find the task overwhelming. For this reason, ISCS has developed a set of individualized evaluation materials as part of its Individualized Teacher Preparation (ITP) program. These materials are designed to assist teachers in their transition to individualized instruction and to help them tailor their assessment of students' progress to the needs of all their students.

The two modules concerned with evaluation, *Individualizing Objective Testing* and *Evaluating and Reporting Progress*, can be used by small groups of teachers in inservice settings or by individual teachers in a local school environment. Hopefully, they will do more than give each teacher an overview of individualized evaluation. These ITP modules suggest key strategies for achieving both subjective and objective evaluation of each student's progress. And to make it easier for teachers to put such strategies into practice, ISCS has produced the associated booklets entitled *Performance Objectives, Performance Assessment Resources,* and *Performance Checks*. Using these materials, the teacher can objectively assess the student's mastery of the processes, skills, and subject matter of the ISCS program. And the teacher can obtain, at the moment when they are needed, specific suggestions for remedying the student's identified deficiencies.

If you are an ISCS teacher, selective use of these materials will guide you in developing an individualized evaluation program best suited to your own settings and thus further enhance the individualized character of your ISCS program.

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THE ISCS INDIVIDUALIZED TESTING SYSTEM

The ISCS individualized testing system for each level of ISCS is composed of four major subdivisions:

1. The ITP modules *Evaluating and Reporting Progress* and *Individualizing Objective Testing*,
2. *Performance Objectives*,
3. *Performance Checks* in three alternate forms, and
4. *Performance Assessment Resources.*

Evaluating and Reporting Progress presents a comprehensive overview, with many refinements, for individualizing the grading and reporting of students' progress, based on both subjective and objective criteria. The module *Individualizing Objective Testing* describes more specifically those ISCS evaluation materials which have objective criteria – the performance objectives, checks, and resources – and it presents practical suggestions for their use. These two modules should be considered prerequisite to successful use of the other ISCS evaluation materials.

Each of the *Performance Objectives* booklets contains a composite list of selected measurable objectives considered important to a given level of the ISCS program. However, many of the long-range goals and aims that are at the heart of the ISCS program do not lend themselves to being expressed as measurable performance objectives. Thus, these booklets should not be construed as being all-inclusive anthologies of all the possible learning outcomes of ISCS.

Each of three *Performance Checks* booklets contains an equivalent but alternative set of performance checks which were developed to assess the students' achievement of the objectives stated in the *Performance Objectives* booklets.

The *Performance Assessment Resources* booklet is a teacher's handbook to be used in identifying the appropriate performance checks with which to evaluate each student. The booklet also indicates how to set up testing situations, correct responses, and give remedial help.

NOTES TO THE TEACHER

An overview of evaluation, including both objective and subjective criteria, is given in the module *Evaluating and Reporting Progress* and many aspects of this booklet are described in more detail in Chapter 3 of the module *Individualizing Objective Testing*. These notes are meant to augment, not replace, Chapter 3 of that module. As you use this booklet, you will begin to see ways to modify its suggestions to meet your needs better. You are encouraged to enter your modifications at the points at which they apply. Only by altering these materials will you evolve an evaluation system best suited to your own classroom environment. It is important to remember that only principles involved in objective criterion-referenced evaluation are applied in this booklet. Therefore, you will obviously want to incorporate subjective criteria also.

Units and Chapters

There are at least two *Performance Assessment Resources* booklets for each level of ISCS. These booklets are divided into units, thus breaking up a single level of the ISCS program into easily handled sections of correlative chapters and related excursions. The relationship between the units and the chapters of *Probing the Natural World/2* are shown in Table 1.

LEVEL II

UNIT	CHAPTERS
1	1 and 2
2	3 and 4
3	5 and 6
4	7 and 8
5	9 and 10
6	11 and 12
7	13 thru 15
8	16 and 17
9	18 and 19
10	20 and 21
11	22 thru 24
12	25

Table 1

Most units include the objectives and performance checks for two chapters and their related excursions. You will recall that the number before the hyphen in the identification number for an excursion states the chapter to which it is related. The individual objectives and performance checks for each unit are to be selected and used when the student has completed the designated chapters and any excursions he wishes to do. This delay should ensure that there is no premature assessment of the student's achievement of concepts and skills which may be introduced early in a unit, but which require development throughout the unit. Thus, subdividing units for assessment purposes should be done with great care. Keep this in mind if you decide to spot check students as they proceed through units, rather than conducting a formal evaluation at the end of the unit.

Summary Table

Each unit begins with a double-spread "Performance Check Summary Table." The left-hand page of the "Summary Table" serves as a table of contents for the unit. It provides a great deal of information about the objectives pertinent to the unit. Usually about twenty-five objectives for each unit are introduced for the first time in each "Summary Table." A maximum of ten relevant objectives from previous units are reintroduced.

On the left-hand side of the "Summary Table" is a list of code numbers, each of which is unique to one objective within the level. Two examples of code numbers and their meaning are illustrated in Figure 1 below.

03	-	Core	-	17	and	05	-	Exc	19-2	-	2
unit		based on core material		17th objective in unit		unit		based on excursion material	excursion number		2nd objective for excursion

Figure 1

The core objectives appear first in an order that corresponds roughly to the text development. Exceptions to this ordering were made to place objectives based on related processes or content together. Objectives based on remedial excursions are numbered as core objectives because they involve skills essential to success in core activities. Next are listed the general or enrichment excursion objectives, and these are followed by objectives from prior units which are again considered important to the students' progress. These repeated objectives are easily spotted, as a capital R (for Repeated) appears after their identifying code number, giving a listing such as 03-Core-17R. The specific resource aids to be used with repeated objectives are given in the units designated by the code number (unit 3 in the just-cited example), and the information is not repeated each time within the textual material that follows the "Summary Table."

Each objective code number is followed by a short descriptive statement of that objective. These short statements were written, using the students' vocabulary. They should be helpful in communicating the objectives to the students should you desire to do so. Ways to involve your students in selecting the objectives are discussed in the module *Individualizing Objective Testing.*

The right side of the "Summary Table" is made up of eleven columns. Letters are used in the first five to designate the characteristics of the performance check. The letters and their meanings are as follows:

M - Completing the check requires regular ISCS materials.
O - An observer should view the student's performance as he does the check.
P - Completing the check requires the use of specially prepared materials.
Q - The answer to the check is of the quick-scoring variety.
T - The check will require more than three minutes of the student's time.

Check marks in the next four columns help the teacher assign appropriate performance checks to individual students. The first of these columns is entitled "Basal." Achieving the objectives checked in this column is considered essential to the student's progress. These performance checks may be assigned to any student; however, better students will find that many of these offer little or no challenge.

Check marks in the columns headed "Math," "Reading," and "Concept" indicate performance checks which require a higher level of computational skills, a higher reading level, or a greater ability to think abstractly than the performance checks for most other objectives. Performance checks which have no marks in any of these four columns are considered to be more than basal, but the skills which they require are within the capabilities of most students.

A tenth column lists the action verb that identifies the theoretical mental process required of the student to complete the performance check for the objective. A precise definition of each of the verbs used to designate mental processes is given in the module *Individualizing Objective Testing.*

Finally, in the eleventh column, space is provided for notes. Although you will find an occasional comment printed here, this space is mainly for your notes. It's a good place to put any special instructions or preparations you have found helpful.

As mentioned earlier, some objectives are repeated objectives – ones that have appeared in previous units. When such an objective is listed again in the "Summary Table," its classification as basal or as presenting math, reading, or conceptual difficulties is likely to be different. This change most often derives from a change in purpose. The first time a concept of skill is introduced, the intent may be only to introduce students to it. When reintroduced in a later unit, the skill or concept is frequently developed and used extensively. Thus, in the "Summary Table" for the earlier unit, objectives related to a concept are likely to be classified as conceptually difficult for many students, whereas in the later units, the same objective might be reclassified as basal.

Organization of Resources

Immediately following each "Summary Table" comes the bulk of the resource material for each objective introduced in that unit. Once more, each objective is identified by its code number, but this time it appears in bold, black print in the outer margin directly beside the applicable resource. A pair of horizontal lines separates the resources for each objective from those for the previous and following objectives. When no horizontal line appears at the bottom of a page, the resource material for the objective is continued on the next page.

The functions of the various component resources provided for the objectives are listed below. Two of the components (Regular Supplies and Special Preparations) only appear when they are needed for a particular check. When the performance check does not require any supplies, the supply headings are omitted. Observe the functional descriptions carefully – they are the keys to the types of resource materials provided in the *Performance Assessment Resources* booklet.

COMPONENTS	FUNCTION
Descriptive Statement	This statement duplicates the one that appears in the "Summary Table." If you misread a code number and find yourself looking at material for the wrong objective, this should stop you and send you back to the Table to check. More important, it should briefly indicate to you the basic purpose of the objective.
Objective	The underlined verb in this statement of the objective indicates the theoretical mental process that the student will perform. The phrase following it indicates the content or process skill which the student must perform. A complete description of the verbs and their meanings can be foundin the ITP module *Individualizing Objective Testing*
Regular Supplies	This section lists any ISCS equipment that the student will need – regular equipment that is being used in the unit on which the student is being evaluated or in previous units.
Special Preparations	Don't overlook this section. It lists and describes materials the teacher must collect or prepare in some way. Included are special solutions, special packaging, and labels required for materials for evaluation purposes. The section also specifies particular grids that the students will need for graphing.

Student Action	This is a general description of what the student should do in responding to any of the three performance checks based on the objective. If his expected response is to state a general principle, it is listed in this section. If the three performance checks require specific answers, they are provided below the general statement in the student action.
Performance Check A	Performance Check A is fully stated to allow for a quick review of the statement of the tasks as they are presented to the student. Performance Checks B and C generally present slightly different situations or wording but ask students to perform equivalent tasks.
Remediation	This final section outlines suggested action that can be taken if the student fails to achieve the objective. In some of the remediations, the listed steps are sequential; in others the steps represent options from which it is suggested that you select one or two. Some remediations suggest referring the student to review sections of the core, doing an excursion, or reviewing a self-evaluation question and its response.

How to Find It

Locating a particular objective whose number you know is easy. Just thumb through the pages watching for the unit number which appears in large black print above the word *core* or *excursion* in the margins. But suppose you wish to locate an objective pertinent to a given section or chapter of the text and you don't know the number. Here is a procedure to follow:

1. Determine the unit in which the chapter occurs, using Table 1.
2. Thumb through this booklet until you find that unit number as the beginning digits of any code number appearing in large black print in the outer margin.
3. Look for the "Summary Table" at the beginning of that unit.
4. Use the "Summary Table" to determine the number of the objective you seek.

Be Selective

The resource books for each level contain many more objectives and resources than any one teacher can use. If you add objectives and resources, and you probably will, your list will expand further. The most successful user of this catalog will be the teacher who picks and chooses selectively to meet the specific needs of his students. Therefore, once you are familiar with this book, it is imperative that you establish a system of selecting and assigning checks to the student. Suggestions on how to establish such a system are given in Chapter 3 of the module *Individualizing Objective Testing*.

Whatever selection and assignment system you develop, it must give due regard to individual student's differences. For example, if you administer too many recall performance checks to a high-ability student, he will not only be bored but you will also fail to assess his progress adequately. Too many difficult items administered to a low-ability student leads to frustration and reinforcement of the "I knew I couldn't do it" attitude. On the other hand, even the best students need their egos inflated by some questions that they can answer easily. And, the less able student needs to be appropriately challenged. Be careful, too, of placing too much emphasis on objectives. This may lead students to place undue emphasis on tests, thus slowing their progress to the extent that they lose interest in the story line.

Assigning Performance Checks

How many performance checks should be assigned to a student? This question has no fixed answer. The primary concern is that performance checks provide the needed feedback to both you and the student. If, in your judgment, evaluating a student on a particular unit is unnecessary, then don't do it. If you feel a student needs to be evaluated, then assign an appropriate selection of performance checks. *Individualizing Objective Testing* makes suggestions about how to do this. In no case should any student be assigned all the performance checks or even a random sampling of them. Such a practice would subject the student to tasks which would be either unduly difficult and time-consuming or perhaps too simple for him and therefore meaningless, time-wasting activities.

You may wish to specify the equivalent form (A, B, or C) of performance checks that the student should do when assigning the specific performance check numbers. There is, of course, no difference in their difficulty level. In any case, have the student record both the number and the letter of the specific performance check he does. These numbers and letters should appear on his answer sheet, as they will be needed to check his response. Since the numbers are unique within each ISCS level, there is no need to use a student's time copying the performance checks. Listing the number with the response is sufficient. It's a good idea to remind students frequently that their answers must go on separate paper – not in the *Performance Checks* books.

As you assign checks, keep the supply situation in mind. You won't want too much of some equipment tied up in Special Preparations at any one time. To avoid this, keep abreast of the range of your students' progress and prepare only those materials you anticipate needing, referring to the P's appearing in the third column on the right-hand page of the "Summary Table." Batteries, of course, will need replacement or recharging occasionally, and specially boxed supplies should be checked periodically for missing or nonfunctioning parts.

At the back of Part 2 of the *Performance Assessment Resources,* you will find grids identical to those the students must use in certain performance checks. The grids at the back are suitable for reproduction. You may make copies directly, using one of the well-known commercial copiers. For large quantities at low cost, make a master by the thermo process and use it to make duplicates. If you make copies in either of these ways, your students will not be wasting time drawing grids, and you will feel free to assign objectives that need grids.

Chapters 1 and 2 Performance Check

Excursions 1-1 thru 2-3 Summary Table

Objective Number	Objective Description
01-Core-1	Recognizes that physical descriptions alone may not identify substances
01-Core-2	States what to do if chemicals spill on someone
01-Core-3	Follows safety procedures during a chemical reaction
01-Core-4	Uses a reaction to see if a powder is rock-like or shell-like
01-Core-5	Uses acid to identify samples of rock and shell
01-Core-6	Selects the property which changes least as particle size changes
01-Core-7	Draws a diagram to show the makeup of matter
01-Core-8	Selects the origin of scientific models
01-Core-9	Selects statements taken from the ISCS particle model
01-Core-10	Selects the best description of a scientific model
01-Core-11	Selects characteristics of scientific models
01-Core-12	Names the state of matter of common materials at room temperature
01-Core-13	States two things a scientific model does
01-Core-14	States a definition for *mass*
01-Core-15	Indicates that all matter is made up of particles
01-Core-16	Recognizes the relationship between mass and matter
01-Core-17	Uses a definition of *matter* as an operational definition
01-Core-18	Uses a balance to measure mass

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				applies	
						√				recalls	
	M	O	P			√				chooses	
	M		P		T					classifies	
	M		P		T	√				applies	
				Q						applies	
						√				applies	
				Q		√				recalls	Also use with Excursion 1-1.
				Q					√	classifies	Also use with Excursion 1-1.
				Q					√	applies	Also use with Excursion 1-1.
				Q					√	classifies	Also use with Excursion 1-1.
				Q		√				classifies	
									√	recalls	Also use with Excursion 1-1.
									√	recalls	
				Q		√				applies	
				Q					√	applies	
						√				applies	
	M		P	Q		√				manipulates	Also use with Excursion 2-1.

Objective Number	Objective Description
01-Core-19	Converts cubic centimeters to milliliters
01-Core-20	Finds the volume of a liquid
01-Core-21	Determines whether a gas is matter and explains his answer
01-Core-22	Names the form of matter in a bubble
01-Core-23	Indicates the locations of safety equipment
01-Core-24	Cleans up the work area at the close of class
01-Core-25	Cooperates with lab partners
01-Core-26	Returns equipment promptly to storage areas
01-Core-27	Responds to text questions
01-Core-28	Shows care for laboratory materials
01-Exc 2-2-1	Matches metric units to the quantities of measurement that they express
01-Exc 2-3-1	Indicates factors on which weight depends
01-Exc 2-3-2	Selects the property of matter that depends upon location
01-Exc 2-3-3	Selects factors which determine weight on earth

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
										applies	
	M		P							applies	
						√				classifies	
				Q		√				recalls	
			P			√				recalls	
		O				√				chooses	
		O				√				chooses	
		O				√				chooses	
		O				√				chooses	
		O				√				chooses	
				Q						classifies	
									√	recalls	
				Q						recalls	
				Q					√	recalls	

O1 Core 1

Recognizes that physical descriptions alone may not identify substances.

The student applies the concept that physical descriptions alone may not provide enough information to enable a person to distinguish between substances.

Student Action: Responding negatively and in effect that the samples could be the same substance or different substances and still have the differences mentioned in the descriptions.

Performance Check A: An unmanned spacecraft landed on Mars and sent back only the following information about two samples, X and Y, found on the surface. Nothing else is known about them.

1. Can you be certain that samples X and Y are different substances?
2. Explain your answer.

	SAMPLE X	SAMPLE Y
Color	white	white
Texture	rough	smooth
Volume	8 cc	9 cc
Luster	dull	dull

Remediation: This concept underlies Activity 1-1 and the table of observation recorded in Table 1-1. Have the student review them. Point out that some people might not agree on the meaning of *rough* and *smooth*. What seems rough to one person may not to another. Also ask such questions as "If there is more of substance X than of substance Y, does that make them different kinds of material?" Have the student check his response to Self-Evaluation 1-6.

O1 Core 2

States what to do if chemicals spill on someone.

The student recalls the procedure to follow when a dangerous or unknown chemical has been spilled on a person.

Student Action: Stating at least two of the following procedures: (1) rinse the area with plenty of water, (2) call the teacher, and (3) if possible, show or tell the teacher what chemical it was.

Performance Check A: If someone splashes an unknown or a dangerous solution on himself or someone else, what two things should he do?

Remediation: Refer the student to the safety notes on pages 4 and 14 of the text and to any special notices that you have placed in your classroom. Part E of the front matter in the Teacher's Edition to *Probing the Natural World/2* has many notes and suggestions related to safety. Many states require a review of safety procedures with your students. Whether this is a law in your state or not, it makes good sense.

01 Core 3

Follows safety procedures during a chemical reaction.

The student chooses to use safety glasses to protect his eyes during a chemical reaction.

Regular Supplies: 1 pair of safety glasses

Special Preparations: To prepare box 01-Core-3, fill a cellophane bag ¾ full of baking soda or crushed shells and tie it closed. The box should also contain three dropper bottles of dilute HCl each dyed a different color with a drop of food coloring. Label the bottles B, D, and F.

Student Action: Putting on safety glasses prior to mixing reactants. The student's observations are not being checked. Only his use of safety glasses is relevant here.

Performance Check A: Get any materials you need in addition to those in box 01-Core-3 to complete this item. Place ¼ of a teaspoon of powder from the bag into a beaker. Add about 5 drops of the acid in bottle B to the powder. Record the observations that you make.

Remediation: Here the student is being asked to do one thing and you are really observing another. The student may choose to use the glasses for a variety of reasons: you, an administrator, or state law may require their use, or the student may see a need for them for his own reasons. If it is your requirement, remind him of that and point out any notices that you may have to that effect. Page T 34 of the Teacher's Edition of the text has a list of safety rules that might well be displayed. It could be that the student is not aware of the presence of safety glasses or when to wear them. Point these things out now.

01 Core 4

Uses a reaction to see if a powder is rock-like or shell-like.

The student classifies the powder as being shell-like or rock-like on the basis of its reactions.

Regular Supplies:
sodium bicarbonate
rock
shell
3M HCl in dropper bottles
1 magnifying glass
1 pair of safety glasses
1 balance
1 beaker
1 graduated cylinder

Special Preparations: Put baking soda into three bottles labeled 01-Core-4A, 01-Core-4B, and 01-Core-4C. To vary the appearance of the three bottles add one of the following to each bottle: pepper, colored chalk dust, fine sand, or powdered rock.

Student Action: Stating that the powder is more like shell than rock because it reacts with the acid.

Performance Check A: Get a piece of rock, a shell, and enough of the powder in the bottle labeled 01-Core-4A to cover the bottom of a test tube. You may use any or all of the following equipment that you need – a beaker, a balance, a magnifying glass, a bottle of hydrochloric acid (HCl), and safety glasses.

1. Is the powder more like rock or like shell?
2. Explain your answer.

Remediation: The student should see that the baking soda is like the shell in its reaction with acid. The soda is not like the rock in any of the characteristics suggested. Refer the student to question 1-13 on page 6 of the text and ask him to consider each item in the question carefully. Ask him about his confidence in each specific property which indicates similarity to the rock.

01
Core
5

Uses acid to identify samples of rock and shell.

The student applies the concepts that the chemical properties of a solid substance are the same regardless of the size of the pieces of that substance.

Regular Supplies: 3M HCl in a dropper bottle
2 baby-food jars

Special Preparations: Place crushed shell and one teaspoon of crushed pepper in a small plastic bag labeled 01-Core-5X and crushed noncarbonaceous rock or white sand in a bag labeled 01-Core-5Y. Also prepare a small dropper bottle of 3M HCl.

Student Action: Naming the rock and shell particles correctly and stating in effect that they are identifiable because they react just like the larger pieces of these materials.

A, B, and **C:** 1. Y, 2. X

Performance Check A: Get two baby-food jars. Label one X and the other Y. From the supply area, get the two bags, labeled 01-Core-5X and 01-Core-5Y. Take a small sample of powder from each bag. Also get a dropper bottle of hydrochloric acid (HCl). If your room has an acid area, do your test there.

1. Which sample is rock powder?
2. Which sample is shell powder?
3. How did the observations you made allow you to identify which powder came from rock and which powder came from shell?

Remediation: (1) Ask the student what the reactions of whole rock and of shell were when HCl was applied to them. If that response is correct, ask whether he would expect the behavior of the ground-up rock and shell to be different from the reaction of the whole rock and shell when HCl is applied. (2) If the student answers the question regarding the reaction of whole rock and shell with HCl, refer him to Activity 1-2 and have him use both rock and shell. If the student gets the first question but not the second, have him examine Table 1-2 in his *Record Book*. (3) Have the student review his response to Self-Evaluation 1-3.

Selects the property which changes least as particle size changes.

01
Core
6

The student applies the concept that the chemical reactions of a particular substance are independent of its particle size.

Student Action: Selecting the entry that indicates a chemical reaction.
- **A:** d
- **B:** c
- **C:** b

Performance Check A: Tony has a solid material. If he ground it to a powder, which of the following would change the least?
- a. Its roughness
- b. Its glass-like appearance
- c. Its shape
- d. Its reaction with HCl

Remediation: (1) Have the student explain the basis on which he answered Self-Evaluation 1-7. (2) Have the student try the reaction of HCl and shell, using whole shell, shell pieces, and powdered shell. Ask if the reaction was the same. Then ask him to consider the changes in size, roughness, and shape of the shells in the three conditions. Ask again which property changed the least.

Draws a diagram to show the makeup of matter.

01
Core
7

The student applies the concept that matter is made up of particles.

Student Action: Drawing a diagram of the internal structure of matter which indicates numerous small particles and stating the effect of the concept of the particulate model of matter.

Performance Check A:
1. Draw a diagram which shows what you would expect to see if you could shrink to a size small enough to walk around inside a piece of pure copper.
2. Explain your diagram.

Remediation: If the student's diagram indicates anything but particles and he has not done Part B of Excursion 1-1, suggest that he do it. It is a remedial excursion that reviews the idea of a particle model with which *Probing the Natural World/1* ended. Students who have not experienced the first level of ISCS science would be well-advised to do Excursion 1-1.

Selects the origin of scientific models.

01

The student recalls that the models of science are created in the people's minds.

Core 8

Student Action: Selecting the phrase which indicates that models are mental constructs.

A: c
B: b
C: a

Performance Check A: Select the best answer below. Scientific models are

a. statements of the way matter and energy really are inside of materials.
b. statements of what the best scientists have observed with their own eyes.
c. creations of the minds of people, made up to explain observations.
d. unchangeable facts.

Remediation: This is a most important concept, one on which this level of ISCS is based. The student must see that scientific models are explanations or analogies created in the minds of scientists and not things which are directly observable. See the student's response to Self-Evaluation 1-2f. Ask him to explain some phenomenon and then label his explanation a model. For example, you could ask the student to put HCl on both whole and ground shell and then try to explain any differences in the amount of fizzing that were observed by telling how the whole and ground shell differed. If the student has not done Excursion 1-1, have him do it at this time, especially Part A, which expands the idea of the role of model building in science.

O1
Core 9

Selects statements taken from the ISCS particle model.

The student classifies statements to the effect that matter particles move, are closest together in solids, have energy, and make up all matter and that heat energy increases the motion of the particles as assumptions of the particle model.

Student Action: Indicating at least two of the three correct statements and not more than one inappropriate statement as assumptions of the particle model.

A: a, d, and e
B: a, b, and e
C: b, c, and e

Performance Check A: Record the letters of all statements below which are part of the particle model of matter.

a. Matter particles can move.
b. All matter is composed of one kind of matter particle.
c. Matter particles move at a constant speed.
d. Matter particles have energy.
e. Matter is made up of particles.

Remediation: This question summarizes the last chapter of the ISCS Level I text, as well as Part B of Excursion 1-1 Level II. You may have assumed that your Level I students had covered this information. That is true only for those who completed the book. Somewhat fewer than one-third of the students do so. Question 4 of the Checkup on page 8 is a good place to direct the student. If he missed any of these items, he should have done Excursion 1-1. If not, suggest that he do so now. Ask him to explain his answer to Self-Evaluation 1-1 which refers to the same material.

---

01 Core 10

Selects the best description of a scientific model.

The student applies the concept that scientific models are better thought of as useful than as correct.

Student Action: Selecting the statement that describes scientific models as useful rather than as correct.

A: b
B: d
C: c

Performance Check A: Select the letter of the choice below which best completes the statement. A scientific model

a. always provides correct answers to scientific questions.
b. is used because it helps to explain observations and to predict other observations, not because it is known to be correct.
c. states what happens in nature and therefore is correct.
d. is always thrown out when it has failed to predict a new observation or when it does not explain a new observation because the model has been shown to be incomplete.

Remediation: (1) The idea in this check is stated both in the first paragraph on page 9 and in the first two paragraphs on page 355, Excursion 1-1. The idea of the usefulness of models is implied in the text preceding and following those statements. (2) Have the student explain his answer to Self-Evaluation 1-9. (3) One thing you can do to drive home this concept is to have him do Part A of Excursion 1-1 and ask whether his model for the workings of the Think-A-Dot game is best described as correct or useful. If the student says that his explanation is correct, challenge that interpretation. If you can offer another explanation that "works," both cannot be correct but both can be useful.

---

01 Core 11

Selects characteristics of scientific models.

The student classifies statements as characteristics of scientific models – it explains observations, it can include a physical object or a set of objects, and it can be a mental picture.

Student Action: Selecting at least two of the three statements listed above as characteristics of a scientific model but not the statement which indicates that it is an observation.

A: Two or more of a, b, and d, but not c.
B: Two or more of a, c, and d, but not b.
C: Two or more of a, b, and c, but not d.

Performance Check A: Select the statements which are true about a scientific model.

a. It explains observations.
b. It can include a physical object or a set of objects, such as blocks and wire.
c. It is an observation.
d. It can be a mental picture.

Remediation: It is very important that the student get this concept before moving on in the course, as this is the central idea of the Level II program. It is so easy for a student to think only of a tangible object when thinking of a model. The danger is that the model becomes the substance or idea to him. Refer the student to Excursion 1-1 and to Self-Evaluation 1-2. If you have a copy of *Probing the Natural World/1*, have him read Chapter 21 for a slightly different slant on similar material.

01
Core
12

Names the state of matter of common materials at room temperature.

The student classifies the substances as existing at room temperature as solids, liquids, or gases.

Student Action: Labeling S, L, or G, at least six of the eight substances correctly.

A: 1. L, 2. S, 3. S, 4. G, 5. L, 6. L, 7. S, 8. G
B: 1. L, 2. S, 3. G, 4. S, 5. S, 6. G, 7. L, 8. S
C: 1. G, 2. S, 3. S, 4. G, 5. L, 6. L, 7. S, 8. L

Performance Check A: Copy the numbers of the words below onto your paper. Tell whether each substance is found at ordinary room temperature as a solid, a liquid, or a gas. Write S (for solid), L (for liquid), or G (for gas) after its number on your paper.

1. Oil
2. Rubber
3. Iron
4. Oxygen
5. Cola
6. Milk
7. Nylon
8. Air

Remediation: (1) This is a concept that the ISCS authors assume students to know. It is not covered in the text. Show the student some examples. (Use some of those referred to in the performance check.) Ask him to try to write or tell you a definition of *solid*, *liquid*, and *gas*. Don't concern yourself with the wording; see if the student has grasped the concept of a solid as any substance having a definite shape and size, of a liquid as a substance that takes the shape of its container, and a gas as a substance not having a definite size or shape which distributes itself uniformly throughout the container. (2) Ask the student to explain his choice in Self-Evaluation 2-7.

01

States two things a scientific model does.

The student recalls two functions of a scientific model.

Core 13

Student Action: Stating two of the following: a scientific model (1) suggests important questions, (2) explains previously made observations, (3) suggests new experiments, and (4) predicts the nature of the results of new experiments.

Performance Check A: A scientific model is very useful to a scientist. Name two things that a scientific model does for a scientist.

Remediation: (1) This idea is expanded in Excursion 1-1 and is summarized on page 355 just above question 10. (2) Have the student recall his first model of the workings of the Think-A-Dot game. Did he modify his model after testing it? If he did, then he has, very likely, demonstrated the essence of this objective. (3) Check his response to Self-Evaluation 1-2.

O1 Core 14

States a definition for *mass.*

The student recalls the definition that mass is the quantity of matter in an object.

Student Action: Responding in effect that mass is the quantity of matter in an object.

Teacher's Note: *Mass* should not be defined as a type of force.

Performance Check A: What is *mass*?

Remediation: If the student replies incorrectly, check to see if he is confusing mass and weight. If so, refer him to Excursion 2-3 which explains the difference.

O1 Core 15

Indicates that all matter is made up of particles.

The student applies the concept that anything made up of matter is made up of particles.

Student Action: Designating any substance that he marks as matter as also being made up of particles.

> **A, B, and C:** Any word in the list followed by an M should also be marked with a P, and vice versa. The validity of the "matterness" or "particleness" of a particular entry is irrelevant to the accomplishment of this objective.

Performance Check A: Copy the list of words below. After those things which are made up of particles, place a P. After those things which are matter, place an M. You may place both an M and a P after a word.

1. Paper
2. Nickel
3. Ink
4. Idea
5. Hydrogen

Remediation: These performance checks are based on the information given on page 7, beginning with the paragraph following question 1-18. Refer the student to part B of Excursion 1-1 for a more detailed discussion of this idea. Later the student will be given data which indicate that matter must be composed of more than one kind of particle. Since that comes later, you should not tell the student this fact now, as the opportunity for learning it by discovery is gone if you do.

---

01 Core 16

Recognizes the relationship between mass and matter.

The student applies the concept that all things composed of matter have mass.

Student Action: Designating as being composed of matter all those things that he marks as having mass. Whether the student accurately discriminates between those things composed or not composed of matter is irrelevant to the accomplishment of this objective.

Performance Check A: On your paper, copy the five words listed below. Place an M after those things which have mass. Place an X after those things made up of matter. You may place both an M and an X after a word.

1. Meat
2. Idea
3. Film
4. Air
5. Rainbow

Remediation: (1) A student can identify both mass and matter in the question and still have missed the key concept. Look also to see what was labeled. If "air" was not labeled, for example, the student has missed the concept of matter and cannot understand a stated relationship between mass and matter. Check to see if he understands the concept of matter and then relates mass and matter. (2) This relationship between mass and matter is stated as a definition in the first paragraph on page 12. This is a key concept and the central theme of Chapter 2. The student should review his results for Activities 2-1 through 2-11 and his answers to questions 2-17, 2-18, and 2-19. (3) Ask him to explain his answer to Self-Evaluation 2-5. Then substitute the words *liquid* and *gas* for *solid* and ask how he would answer. Help him to recognize that solids, liquids, and gases are three states of matter, and all matter has mass.

---

01 Core 17

Uses a definition of *matter* as an operational definition.

The student applies the definition that matter is anything that has mass.

Student Action: Responding that he would have to show that the gas has mass or occupies space.

Performance Check A: Suppose you were asked to show that oxygen is matter. What would you have to show about oxygen to prove that it is matter?

Remediation: (1) If the student responds that matter is made up of particles, he probably cannot show that this is true of a gas. Remind him that the question involves a method of proof, and ask him for his method. If he can't provide one, suggest that he focus on another property. (2) If the student's response involves weight, he may have the correct concept (mass) but the wrong label (weight). Refer him to Excursion 2-3. (3) *Matter* is defined in the first paragraph of page 12. Remember that because a student can say the words does not mean that he understands them. A way to check his understanding of this most important concept is to ask the question raised in question 2-15, or one similar to it. (4) If he answers question 2-15 incorrectly, do an oral review of Activity 2-11 and his responses to questions 2-16 through 2-19. This will reveal whether he has grasped the concept that all matter has mass. (5) Check his response to Self-Evaluation 1-5.

01
Core
18

Uses a balance to measure mass.

The student manipulates the balance and standard masses to measure the mass of the specified objects on the balance.

Regular Supplies:

1 double-pan balance
1 set of masses
1 small test tube
1 small air piston
1 rubber stopper
1 carbon rod
1 small rock
1 sinker

Special Preparations: Get one piece of each item listed below. Determine its mass, enter your findings in the proper space below, and place it with the other items in a box labeled 01-Core-18.

small test tube _____ a sinker _____ carbon rod _____
small air piston _____ rubber stopper _____ small rock _____

Student Action: Stating the mass of each of two objects to within ±0.5 g of the value obtained by the teacher.

Performance Check A: Get a balance and a set of gram masses. Then, from box 01-Core-18, get a small test tube and a sinker. Find the mass of each of the objects from the box as closely as possible. Write the name of each object and its mass on your answer sheet.

Remediation: The use of a balance is referred to on page 12. Excursion 2-1 is a detailed series of activities designed to familiarize the student with the use of a balance.

The student may have missed the question only because he did not know the relationship of standard masses and gram measures. Check to see if the student has done Excursion 2-1. If he has not, suggest that he do it. After he has completed Excursion 2-1, have him take note of the first paragraph on page 364.

01

Converts cubic centimeters to milliliters.

The student applies the concept that 1 cc = 1 ml.

Core 19

Student Action: Responding with a number of milliliters that equals the number of cubic centimeters.

- **A:** 25 ml
- **B:** 75 ml
- **C:** 20 ml

Performance Check A: If an air piston contains 25 cc of water, what is the volume of the water in ml?

Remediation: The student could be having one or more problems here. Check to see if he knows what you mean by *volume*. He may not recognize the symbols *cc* and *ml*. Of course, the most probable reason for error is not knowing that cubic centimeters are equal to milliliters. This equivalency is stated in Excursion 2-2 on page 371 just below question 4 and also in Table 2 on page 372. Have the student do this excursion if he does not recognize the symbols or if he does not understand the conversions.

01 Core 20

Finds the volume of a liquid.

The student applies the procedure for finding the volume of a liquid.

Regular Supplies: 1 graduated cylinder (100 ml)

Special Preparations: Use three bottles or jars of different shapes but whose volumes are about a pint each. Each bottle should be marked with a line denoting its volume as shown below.

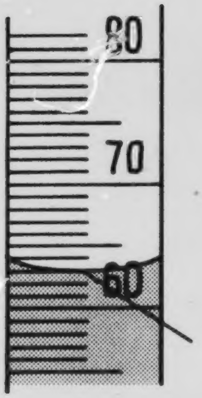
01-Core-20A: 185 ml
01-Core-20B: 235 ml
01-Core-20C: 215 ml

Student Action: Measuring and reporting, in standard metric units, a volume of liquid within 5% of the value established by the teacher.

- **A:** 185 ml
- **B:** 235 ml
- **C:** 215 ml

Performance Check A: Get bottle 01-Core-20A, and fill it with water to the line marked on the side. Use a graduated cylinder to determine the volume of water in the bottle.

Remediation: Determine whether the problem is one of not knowing the meaning of *milliliter* or of not knowing how to read the volume within a cylinder. If the student does not know what is meant by *ml*, refer him to Excursion 2-2. Show the student that to measure a volume, using a graduated cylinder, he must measure from the lowest point on the curve (meniscus), as in the diagram below.



Correct reading

01 Core 21

Determines whether a gas is matter and explains his answer.

The student classifies a gas as matter.

Student Action: Responding affirmatively and stating either that gas has mass or that it occupies space or both.

Performance Check A: John pumped up his bicycle tire, using a gas.

1. Is the gas in the tire matter?
2. How do you know?

Remediation: (1) Have the student redo or review Activities 2-1 through 2-11. The critical question is 2-15. You can ask him this question again, and interpret with him the results of the measurement made in Activity 2-11. Perhaps he did not measure accurately enough to see the loss in mass when the gas was released. Or maybe he does not see the relationship between the release of the gas and the decrease in the mass of the bag and its content. If the latter is the case, it should be evident from his response to question 2-15. (2) If the student's response involves the term *weight*, see the Remediation for 01-Core-17.

01 Core 22

Names the form of matter in a bubble.

The student recalls that the matter inside a bubble is in the form of a gas.

Regular Supplies:

1 air piston
1 small beaker
1 dropper
1 large beaker
water

Student Action: Responding with the notion that the matter released under water is in the form of a gas.

Performance Check A: Get a 10 cc air piston and a 50 ml beaker ½ full of water. Hold the piston away from the beaker and pull the plunger back. Put the tip of the piston under the water, and push the plunger forward. What, if any, is the state or form of matter coming from the piston?

Remediation: (1) If a student does not understand the meaning of *gases, liquids,* and *solids*, show him examples of these three states of matter within your classroom. (2) If his answer to Self-Evaluation 2-2 is correct, ask him to explain how this check differs from that question. (3) To show that gases form bubbles and specifically that the bag of gas can cause bubbles to form, tie up a bag containing HCl and ground shell as in Activities 2-1 through 2-4. Then unseal it as in Activity 2-9. Submerge the inflated bag in water and puncture it with a pin. Have the student note the bubbles formed by the gas.

01 Core 23

Indicates the locations of safety equipment.

The student recalls the locations of safety equipment.

Special Preparations: Duplicate a diagram of the ISCS classroom, indicating positions of key fixed facilities such as doors, windows, and cabinets. Provide the student with a place other than the ISCS classroom to do this performance check.

Student Action: Indicating on the diagram the normal positions of the bucket of sand, the fire blanket, the first-aid kit, the safety goggles, and the fire extinguisher.

Teacher's Note: You may add to the performance check other safety equipment appropriate to your classroom, such as an acid work area, eye washers, and shower. And you may delete any which are not in your classroom.

Performance Check A: On the sketch provided by your teacher, mark the place in your ISCS room where each of the following is normally stored.

1. Bucket of sand
2. Fire blanket
3. Safety goggles
4. CO_2 or soda-acid fire extinguishers
5. First-aid kit

Remediation: (1) Have the student correct his diagram. (2) Have him repeat the performance check the next day, and repeat step (1) if necessary.

01 Core 24

Cleans up the work area at the close of class.

The student chooses to close the laboratory activity period promptly upon receiving notification of the time to do so.

Student Action: Ceasing the ongoing laboratory activity when notified of the time, returning materials in usable, clean condition to storage, and participating in work area cleanup, on at least three separate occasions when being observed by the teacher without his knowledge.

Teacher's Note: The opportunity for assessment of this objective arises almost every day during the course of regularly assigned laboratory activities. Use a few minutes of class time for group instruction early in the school year, and almost every week for reinforcement, to discuss the role of the student in the ISCS learning environment. To encourage personal responsibility in the student, discuss the reasons for his closing his activities promptly (to allow time for himself and others for lab closing activities), returning materials to storage in clean condition (to facilitate their use by others), and participating in area cleanups (to leave the area as clean as he found it).

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) If a student fails to accept this responsibility, approach him individually and review the reasons for his acceptance of it. Emphasize the social responsibility for cooperation in the learning environment for the good of all students. Point out that he has received the benefit of other students' provisions for others as well as for themselves. (2) Do not, at first, suggest that he may lose his privileges unless he cooperates. But if he doesn't cooperate after you observe his behavior several times, ask him if he can suggest a proper penalty. (3) An alternative remedy may be to request him to assist in the process of overall classroom accounting of the materials for a period of time until he recognizes the importance of the student's role. (4) Do not use extra cleanup as a penalty for not cleaning up properly. In other words, don't use something as a penalty that you want done willingly.

01
Core
25

Cooperates with lab partners.

The student chooses to cooperate with fellow students in the laboratory.

Student Action: Being polite, waiting his turn, being orderly when moving about, and observing the right of his classmates to work without being unnecessarily disturbed, when observed without his knowledge by the teacher or another designated person on at least three occasions.

Teacher's Note: The opportunity for assessment of this objective arises almost every day during the course of regularly assigned laboratory activities. Use a few minutes of class time at the beginning of a session for a whole-group discussion early in the school year and several times later on to discuss the need for cooperation with and consideration of other students. Some particular points for discussion include being polite, waiting patiently, not making others wait longer than necessary, being orderly when moving about, and observing the right of others not to be disturbed. Talk about each student's accepting the personal responsibility for his own behavior in the group situation.

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) If a student fails to accept any of these responsibilities, approach him privately and review the reasons for his lack of cooperation with his fellow students. Suggest that he pay some attention to changing his behavior to more acceptable standards. (2) Find out if the student feels that he is behaving in a less than acceptable way. If so, ask him whether he feels some penalty should be imposed and what he thinks a suitable penalty would be.

01
Core

Returns equipment promptly to storage areas.

The student chooses to show personal responsibility for returning laboratory equipment promptly to the proper storage places as soon as it is no longer needed, during the class period, and not just at the end of the period.

26

Student Action: Returning equipment and materials no longer needed to the proper storage places on at least three occasions when observed by the teacher or another designated observer without his knowledge of being checked.

Teacher's Note: This objective may be assessed at any time the student is responsible for learning activities requiring the use of equipment and supplies. Use a few minutes of class time for group discussion of the reasons for returning equipment to storage areas promptly when it is not being used by the student or by his group. The reasons include (1) the short supply of certain items and the need to cooperate with others, (2) the chances of equipment's being misplaced, (3) the possibility of accidental damage to equipment, and (4) the greater opportunity for pilferage by an irresponsible student when things are disorganized.

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: In a private conference, discuss the reasons for the student's cooperation in this request. Ask for that cooperation. See also Remediations (1), (2) and (3) for 01-Core-24.

---

01 Core 27

Responds to text questions.

The student chooses to write his answers to 90% or more of the textbook questions in his *Record Book*.

Student Action: Exhibiting the written responses when requested to do so. At least nine out of ten questions should have responses, be they correct or incorrect.

Teacher's Note: It is intended that this objective be assessed throughout the year, not just at a formal unit assessment period. Such a check provides opportunities to encourage students to work nearer their capacities while remaining independent of the teacher. Use a few minutes of class time for a group discussion of the reasons for writing the answers in the *Record Book*. Writing in the *Record Book* serves (1) to help the student think through what he sees and does, (2) to preserve ideas for future reference, (3) to make a record of the student's progress through the core, (4) to provide the teacher with a source of input for analyzing the student's difficulties and progress, and (5) to help the student learn the background ideas for conceptual understanding. Writing in the *Record Book* is "in"; writing in the text is "out."

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) In a private conference, discuss with the student the ideas enumerated and ask why he chooses not to write the answer. (Perhaps he cannot write!) Evaluate his reasons and counsel him accordingly. Encourage him to follow the pattern of his classmates and set down his ideas as they are doing. (2) Have him read

"Notes to the Student," pages xvii through xviii in his text. (3) Follow up in a few days to determine his actions.

01
Core
28

Shows care for laboratory materials.

The student chooses to show proper care and use of ISCS laboratory materials.

Student Action: Using the materials only for their intended purpose or requesting permission to do other specific experiments with them when being observed without his knowledge by the teacher or another designated person on three or more occasions.

Teacher's Note: This objective may be assessed at any time that the student is responsible for a learning activity in which equipment and supplies are required. Use a few minutes of class time for a whole-group discussion of the reasons for handling laboratory materials properly. Such reasons include: (1) If damaged, they are lost to use by students who need them now. Short supply means waiting in line. (2) They cannot readily be replaced. Replacement usually takes several months at best. (3) If materials are handled properly, they may be used for other than regular activities (with the permission of the teacher and after making a proper request).

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) In a private conference, ask the student why he chooses to mishandle equipment. Help him to evaluate his reasons, and ask for his cooperation in the future. If he agrees, reassess the objective later. (2) If after the conference he still does not agree, ask him if he feels that he should be penalized and what he thinks would be an appropriate penalty. Give him another opportunity for compliance. (3) If he is still uncooperative, apply a penalty for mishandling equipment. This may mean denying him use of the equipment either temporarily or permanently or taking some other suitable action.

01
Exc
2-2
1

Matches metric units to the quantities of measurement that they express.

The student classifies metric units of measurement as to the quantities they measure.

Student Action: Matching the metric units to the quantities they express in at least four of the six cases.

A: 1. Mass, gram
2. Volume, liter
3. Speed, meter/second
4. Temperature, °C
5. Length, centimeter
6. Density, gram/milliliter

B: 1. Mass, gram
2. Volume, milliliter
3. Speed, meter/second
4. Temperature, °C
5. Length, centimeter
6. Density, gram/cc (ml)

C: 1. Mass, gram
2. Volume, milliliter
3. Speed, meter/second
4. Temperature, °C
5. Length, meter
6. Density, gram/milliliter

Performance Check A: Listed in Column A below are six quantities commonly measured in science. Copy them onto your paper.

From Column B, choose the metric unit used to express each of these quantities and write it on your paper after the quantity it matches.

Column A (Quantities)	Column B (Units)	
1. Mass	gram/milliliter	foot
2. Volume	meter/second	°C
3. Speed (distance/time unit)	pound	liter
4. Temperature	cm/second	°F
5. Length	gram	centimeter
6. Density (mass/unit volume)	quart	pound/cu ft

Remediation: First, check to see if the student knows what you mean by *metric unit*. If not, Excursion 2-2 should help. If you have a copy of ISCS Level I, have the student do Excursion 1-1. If he missed "speed" and "density," the problem may be that he did not know what these terms were and skipped them. Point out that they are defined in Column A and that the appropriate units need only to be substituted.

O1
Exc
2-3
1

Indicates factors on which weight depends.

The student recalls that the weight of an object depends upon (1) the mass of the object, (2) the mass of the planet, and (3) the distance from the center of the planet to the object.

Student Action: Stating at least two of the following factors which determine weight: (1) the mass of the object, (2) the mass of the planet, and (3) the distance from the center of the planet to the object.

Performance Check A: Suppose that in the year 2001 A.D. you are asked to lead a team of astronauts to the planet Snoopy in a distant solar system. State two of the three things which would determine your weight on the planet Snoopy.

Remediation: This is a good question for applying knowledge from Excursion 2-3. Refer the student to pages 375 and 376 where the relationship between mass and weight is made.

O1
Exc
2-3

Selects the property of matter that depends upon location.

The student recalls that weight is dependent upon location.

Student Action: Selecting the entry "weight."

A: a
B: b
C: c

2

Performance Check A: Select the letter of the property of a solid that would be different on the earth, the moon, and Mars.

a. Weight
b. Mass
c. Volume
d. Color

Remediation: (1) Make sure that the student knows the terms you are using. Then, for each term, ask whether that property would change if an object were moved to another planet. (2) Chances are that a confusion will occur between the terms *mass* and *weight*. If so, refer the student to Excursion 2-3 which distinguishes between them.

O1
Exc
2-3
3

Selects factors which determine weight on earth.

The student recalls that the important factors determining an object's weight are the earth's mass, his mass, and his distance from the center of the earth.

Student Action: Selecting the entry that includes the following: the earth's mass, his mass, and his distance from the center of the earth.

A: b
B: a
C: c

Performance Check A: Write the letter of the choice below which lists the important factors that determine your weight on earth.

a. Your mass, volume, and distance from the center of the earth
b. Your mass and distance from the center of the earth, and the earth's mass
c. Your mass and volume, and the earth's mass
d. None of these

Remediation: Check to see if the student is confusing mass and weight by asking, "If you were 100 miles above the earth, would your weight be the same, less, or more than your weight on the earth?" If this confusion is his trouble, refer him to Excursion 2-3, where the distinction is made. If he has simply forgotten these three conditions, have him review page 375.

Chapters 3 and 4 — Performance Check

Excursions 3-1 thru 4-3 — Summary Table

Objective Number	Objective Description
02-Core-1	Names the state of matter of air at room temperature
02-Core-2	Recognizes the type of results produced by identical experiments
02-Core-3	Decides whether a single test provides definite evidence
02-Core-4	Selects the better of two operational definitions
02-Core-5	Uses the concept of defining operationally to evaluate an operational definition
02-Core-6	Selects examples of operational definitions
02-Core-7	Selects an identifying test as an operational definition
02-Core-8	Explains similar test results from different substances
02-Core-9	Names gases on the basis of test results
02-Core-10	Names the reactants and products in a chemical equation
02-Core-11	Writes a word equation for a chemical reaction
02-Core-12	Selects gases and things made of matter
02-Core-13	Selects reactants which contain a common matter particle
02-Core-14	Selects a situation using a control
02-Core-15	Gives the definition of *control*
02-Core-16	States why controls are used in experiments
02-Core-17	Tells how to identify matter particles in an unknown substance
02-Core-18	Selects a conclusion consistent with the given data

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
			P	Q		✓				classifies	
								✓		applies	
						✓				applies	
						✓				applies	
						✓				applies	
				Q		✓				classifies	
				Q		✓				applies	
						✓				applies	
				Q						classifies	
				Q		✓				classifies	
						✓				applies	
				Q						applies	
				Q				✓		applies	
				Q		✓				classifies	
									✓	recalls	
						✓				recalls	
						✓				recalls	
				Q				✓		classifies	

Objective Number	Objective Description
02-Core-19	Decides whether the number of kinds of matter particles is equal to the kinds of matter
02-Exc 3-1-1	Recognizes the implication of the same product from a set of substances reacting with the
	same reactant
02-Exc 4-1-1	Selects the variable to be studied
02-Exc 4-1-2	Names factors to be controlled other than the independent variable
02-Exc 4-2-1	Remembers a sensitive test for iodine
02-Exc 4-3-1	Explains identical products from different burned substances
01-Core-2R	States what to do if chemicals spill on someone
01-Core-3R	Follows safety procedures during a chemical reaction
01-Core-7R	Draws a diagram to show the makeup of matter
01-Core-9R	Selects statements taken from the ISCS particle model
01-Core-10R	Selects the best description of a scientific model
01-Core-15R	Indicates that all matter is made up of particles
01-Core-24 thru 28R	(Student's responsibilities)

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
									✓	applies	
									✓	applies	
				Q		✓				applies	
						✓				applies	
										recalls	
										applies	
						✓				recalls	
	M	O	P			✓				chooses	
						✓				applies	
				Q		✓				classifies	
				Q		✓				applies	
				Q		✓				applies	
		O				✓				chooses	

02 Core 1

Names the state of matter of air at room temperature.

The student classifies air as a gas at room temperature.

Special Preparations: Label four jars A, B, C, and D. Fill jars A and D with colored solids such as powdered sulfur and powdered copper sulfate, and cap them. Fill jar B with colored water, and cap it. Jar C is not to be capped and will, therefore, be full of air. Store the jars in a box labeled 02-Core-1.

Student Action: Stating the state of the matter in jar C as gas.

Performance Check A: Get jars B and C from box 02-Core-1 at the supply area. What is the state of matter, if any, in each of the jars?

Remediation: (1) Gases, liquids, and solids are not defined in this course. Set some examples out and label them. Ask the state of various objects in the room like a chain, a person, a window, air, and water in an aquarium. (2) See the Remediation for 01-Core-12.

02 Core 2

Recognizes the type of results produced by identical experiments.

The student applies the concept that when two sets of experimental conditions are identical, the same results are obtained.

Student Action: Responding negatively and with the notion that the experiments must have been different because the results were different and that when two sets of experimental conditions are identical, the same results are obtained.

Performance Check A: Two scientists reported their research. They described their experiments and said they had done exactly the same experiment. However, the results and conclusions of one scientist were completely different from the results and conclusions of the other. They argued that one of them had done something that was different from what he said he had done.

1. Is it possible that they both actually did do exactly the same experiment?
2. Explain your answer.

Remediation: (1) This idea is introduced in the paragraphs following question 3-10 on page 28 of the text. (2) Ask a similar, but more familiar question, like "If you threw a ball exactly the same way each time, would you expect it to land in the same place?" Then relate that question to the one asked in the performance check.

02 Core

Decides whether a single test provides definite evidence.

The student applies the concept that one valid test often does not provide enough evidence for drawing a conclusion.

Student Action: Responding affirmatively and to the effect that the single test is inadequate evidence for drawing a conclusion.

3

Performance Check A: Ann mixed two chemicals. A gas was given off. The gas put out a burning match. When asked if the gas was carbon dioxide, Ann said, "It might be, but I don't know for sure."

1. Was Ann right in saying that she could not tell what the gas was even though she had tested it with the burning match?
2. Explain your answer.

Remediation: (1) This idea is never stated as a rule in the text but is practiced often. For example, after the unknown gas is tested in Activity 3-14, it is suggested in the text that further tests are necessary, as several gases might react this way in this one test. Activities 3-15 and 3-16 provide two more tests of the substance, and the reaction is the same. Therefore, confidence in the original conclusion is increased with each test. (2) Self-Evaluation 3-8 tests this very point. (3) You may want to suggest that the student look in this unit for other examples of multiple tests used to identify a substance.

O2
Core
4

Selects the better of two operational definitions.

The student applies the concept that an operational definition of a substance states a procedure for detecting that substance by a property or set of properties unique to the substance.

Student Action: Responding negatively and to the effect that the proposed definition II includes many gases and therefore is not a good operational definition.

Performance Check A: Operational definition I: Carbon dioxide (CO_2) is a gas which puts out fires, turns phenol red to yellow, and turns limewater milky.
Operational definition II: CO_2 is a gas which is colorless, odorless, and tasteless.
Operational definition II says CO_2 can be detected or identified by observing the properties of the gas itself. It takes less work than the first operational definition.

1. Is operational definition II as useful as operational definition I?
2. Explain your answer.

Remediation: (1) Check the student's response to questions 3-8 through 3-10. Remind him that at that point, all he knew was that the gas was colorless and had no odor. (2) Then have him review pages 28 through 31, and ask him whether the properties he listed in 3-20 (the operational definition of CO_2) were those which were the same for both air and CO_2 or applied only to CO_2, and why they were grouped together.

O2
Core

Uses the concept of defining operationally to evaluate an operational definition.

The student applies the concept that an operational definition must include a property or set of properties unique to the substance being defined.

Student Action: Responding negatively and to the effect that the definition fits more than one substance and an operational definition must contain a property or set of properties unique to the substance.

5

Performance Check A: Becky tested a bottle of atron and a bottle of batrogen. Her data are given in the table below.

TEST	GAS	
	Atron	Batrogen
Reaction with a certain solution	turns red	turns red
Reaction with a lighted match	burns explosively	burns explosively
Effects on the nose	smells bad and stings	smells bad and stings
Reaction with phenol red	turns it yellow	turns it green

She then operationally defined *atron gas* as a gas which (1) turns a certain solution red, (2) burns explosively, and (3) has a bad smell and stings her nose.

1. Is this a good operational definition for *atron*?
2. Explain your answer.

Remediation: This is an application of the idea expressed in question 3-20. Ask what difference there is between this gas and the other, using the operational definition given in the check.

O2 Core 6

Selects examples of operational definitions.

The student classifies any statement which tells how the substance can be detected as an operational definition of the substance.

Student Action: Selecting statements which tell how to detect a substance.

A: a and d
B: c and d
C: b and c

Performance Check A: All the statements below are true. Record the letters of any of the statements which are operational definitions.

a. Oxygen is a gas that causes a glowing splint to burst into flame when the splint is placed into a container of the gas.
b. Chlorine is one of several greenish poisonous gases.
c. Nitrogen is a colorless, odorless, tasteless gas.
d. Iodine is a purple gas that forms when a substance that contains it is heated.

Remediation: (1) Have the student try to apply the question, "How do I tell when I have some of it?" to each of the choices. If the description cannot be used to answer this question, then it is not an operational definition. (2) This idea is expressed on page 31 and in the answer for Self-Evaluation 3-9.

O2 Core 7

Selects an identifying test as an operational definition.

The student applies the concept that an operational definition of a substance consists of a test or set of tests specific for the substance.

Student Action: Selecting the statement that describes a way to detect the substance.

A: c
B: b
C: b

Performance Check A: Consider the following facts.

a. Lithium particles are present in many substances.
b. Most substances containing lithium particles are white.
c. Substances containing lithium turn a flame a bright red color.
d. Substances containing lithium, potassium, and sodium particles have a high boiling point and dissolve very easily in water.

Choose the one statement above that is an operational definition for *lithium.*

Remediation: (1) Suggest that the student review page 31. (2) Have him check his responses to Self-Evaluations 3-9 and 4-6 and tell you what these tell him about oxygen and iodine. (3) Ask him which statement in the performance check tells him the same kind of things about the substances under discussion that those two self-evaluations tell about oxygen and iodine.

O2 Core 8

Explains similar test results from different substances.

The student applies the concept that different substances which contain the same kinds of matter particles yield similar results to the same tests.

Student Action: Responding that the substances react the same way because they probably contain some of the same kinds of matter particles.

Performance Check A: John put some hydrochloric acid on baking soda and on coral. In both cases bubbling occurred. John collected some of each of the resulting gases. In both cases the gas turned limewater cloudy and put out fires quickly. How could such different substances as baking soda and coral both produce gases which react the same way?

Remediation: (1) To answer this check, the student must recognize that the two test results suggest strongly that the gas is the same in both cases. See question 3-20. (2) The student must also recognize that when different reactants produce the same products, it is likely that they are composed of similar materials or at least share some of the same kinds of substances. See question 4-16. (3) Check the student's answer to Self-Evaluation 3-7. (4) Suggest, if necessary, that he do Excursion 4-3, which focuses on the concept of this objective.

O2 Core 9

Names gases on the basis of test results.

The student classifies each of four sets of properties as characteristic of carbon dioxide, of hydrogen, of air, or of an unknown gas.

Student Action: Matching carbon dioxide with the characteristics of turning phenol red to yellow, making limewater cloudy, and not supporting combustion; air with the characteristics of not changing either the phenol red or limewater, but supporting combustion, hydrogen with the characteristics of not changing phenol red or limewater, but exploding in a flame; and the unknown gas with the characteristics of turning phenol red clear, not reacting with limewater, and not supporting combustion.

A: 1. carbon dioxide, 2. air, 3. hydrogen, 4. unknown.
B: 1. air, 2. unknown, 3. hydrogen, 4. carbon dioxide
C: 1. air, 2. hydrogen, 3. unknown, 4. carbon dioxide

Performance Check A: Samples of air, hydrogen, carbon dioxide, and an unknown gas were tested. The results are shown in the table below. List the sample numbers on your paper. After each number, write the name of the gas in the sample.

GAS TESTED	TEST RESULTS		
SAMPLE	PHENOL RED	LIMEWATER	BURNING MATCH
1	turns it yellow	turns it cloudy	puts it out
2	no change	no change	keeps it burning
3	no change	no change	explodes
4	turns it clear	no change	puts it out

Remediation: (1) Have the student review this item, referring to his answers to questions 3-13, 3-15, 3-17, and 3-21. This may also give the student a chance to see the application of his notes to solving problems in science. (2) Check his answers to Self-Evaluations 3-5 and 3-6.

O2 Core 10

Names the reactants and products in a chemical equation.

The student classifies components of a chemical reaction as either reactants or products.

Student Action: Naming those substances written to the left of the *yields* symbol (→) as reactants and those substances written to the right of the *yields* symbol as products.

A: 1. hydrogen and calcium sulfate
2. calcium and sulfuric acid
B: 1. sodium sulfate and silver nitrate
2. silver sulfate and sodium nitrate
C: 1. hydrogen nitrate and cadmium sulfide
2. hydrogen sulfide and cadmium nitrate

Performance Check A:

1. Name the products in the reaction below.
2. Name the reactants in the reaction below.

calcium + sulfuric acid → hydrogen + calcium sulfate

Remediation: (1) This convention is discussed on page 36. After a review of page 36, you may want to give the student other examples such as the following: nail + blue solution → copper coat + clear solution, nail + water → rust + water. (2) Have the student review his answer to Self-Evaluation 3-4.

O2
Core
11

Writes a word equation for a chemical reaction.

The student applies the conventions for word statements for chemical reactions.

Student Action: Writing a word statement for a chemical reaction in which the products are written to the right of the *yields* symbol and the reactants to the left of it and each of the products and each of the reactants is linked by a *plus* symbol.

A: calcium carbonate + hydrochloric acid →
calcium chloride + water + carbon dioxide
B: sulfuric acid + lead → lead sulfate + hydrogen
C: sodium sulfide + silver nitrate → silver sulfide + sodium nitrate

Performance Check A: Write a word statement for the following chemical reaction. Calcium chloride, water, and carbon dioxide are formed when calcium carbonate reacts with hydrochloric acid.

Remediation: (1) A student might miss this simply because he does not know that a word equation such as "shell + hydrochloric acid → carbon dioxide" is called a *word statement*. Check by reviewing his response to Self-Evaluation 3-3. If necessary, define *word statement* for him. This is introduced on page 32. (2) Give an alternate check as a review or use new examples from the core.

O2
Core
12

Selects gases and things made of matter.

The student applies the concept that gases are matter.

Student Action: Labeling as matter anything which he labels as gas.

A, B, and **C:** For any G after a word there must be a corresponding M. It is irrelevant to this objective whether the student identifies the entries correctly as gases.

Performance Check A: Copy the list of words below onto your answer sheet. Place a G after the things which are gases. Place an M after those things which are matter. You may place both a G and an M after a word.

1. Ice
2. Oxygen

3. Wind
4. Air
5. Carbon dioxide

Remediation: (1) This concept was developed in Chapter 2 and nailed down in Activities 2-7 through 2-11. (2) After the student has reviewed these activities in his *Record Book*, ask him why the bag weighed less after the gas escaped than before. (3) Compare his answer with the statement on page 12 that anything that has mass is defined as matter.

O2
Core
13

Selects reactants which contain a common matter particle.

The student applies the concept that when a set of substances produces the same product or products when reacting with the same reactant, there is evidence that the set of substances all contain a common matter particle.

Student Action: Selecting the reactants which react with a common reactant to produce the same product as those which are most likely to contain similar matter particles.

A: The red solid and the amber solid
B: Colored solutions B and C
C: Colorless liquids A and C

Performance Check A: Louie did the reactions below which involved hydrochloric acid (HCl).

1. red solid + HCl → greenish gas (1) + colorless liquid
2. orange solid + HCl → greenish gas (2) + colorless liquid
3. yellow solid + HCl → yellow solid (3) + colorless liquid
4. amber solid + HCl → greenish gas (4) + colorless liquid

He then tested the gases and collected the data below.

GREENISH GAS	BURNED	ODOR	COLOR IN TARTON SOLUTION
1	slowly	sharp	pink
2	exploded	none	blue
4	slowly	sharp	pink

Which of the solid reactants – red, orange, and amber – in the reactions above probably contain similar matter particles?

Remediation: (1) This test item is based on Activities 3-21 through 3-25. Have the student review that section with this performance check available, and see if he can find the parallels. You can pair students and let them review the section together or review this section with the individual student. (2) Suggest that the student do Excursion 3-1, which is an application of Activities 3-21 through 3-25. Those are more concrete operations than this performance check and therefore may be easier to understand.

02 Core 14

Selects a situation using a control.

The student classifies as a control that portion of the sample to be tested which is subjected to all the experimental conditions except the variation of the variable being examined.

Student Action: Selecting the one situation in which a control sample is present.

A: d
B: a
C: b

Performance Check A: Select any of the procedures below in which a control is used.

a. Gail put a solid into a beaker of water. She heated the solution to increase the speed at which the solid dissolved. The solid dissolved.

b. Ron heated solid, blue copper sulfate. It turned white, and something that looked like water came out of the test tube. He didn't have any plain water, but he had a colorless salt solution handy. He added half the salt solution to the white crystals to see if it was water that had been given off. They turned blue.

c. Bobbie wanted to see if a new plant food she bought really worked. She added the plant food to one tray of tomato plants which she watched grow. The tomato plants grew very well.

d. Cathy wanted to know whether beans cooked faster covered or uncovered. She opened a can of beans and put half the beans into each of two aluminum pans. She turned both burners to the same temperature. She covered one of the pans. The other she left uncovered. The covered beans cooked faster.

Remediation: (1) Question the student about the various incorrect choices. How, for instance, does Bobbie in 02-Core-14A, part c, know that the plants grow better with the plant food? (2) Check the responses to the Checkup on page 47 to see if the student practiced determining controls. (3) If the student has not done Excursion 4-1, suggest that he do so and then recheck him, using an alternate performance check.

02 Core 15

Gives the definition of *control*.

The student recalls the definition that a control is a sample equivalent to the sample being tested and to which all the experimental conditions are applied except the variation of the variable being studied.

Student Action: Responding with the effect of the definition above.

Performance Check A: In an experiment, what is a control?

Remediation: (1) This concept is used often in the core and is explicitly stated in the last half of part D, Excursion 4-1. (2) Have the student look at situation 2 of the Checkup on page 47 and then try to write a definition of *control*.

02 Core 16

States why controls are used in experiments.

The student recalls that a control is used in an experiment to help identify the variable which is most related to the results of the experiment.

Student Action: Responding in effect that a control is used to make sure which variable is most related to the results.

Performance Check A: Why is a control used when an experiment is being done?

Remediation: Expect a wide range of answers stating the essence of the idea. (1) Have the student review the series of activities beginning with Activity 4-12. (2) Then ask what information he gained from using tube and nail number 4 or what information he would not have if tube and nail 4 had not been included in the activity. (3) If you feel that the student still does not have the concept, suggest that he do Excursion 4-1, pages 389 and 390. Then reassess the objective, using an alternate performance check. (4) Have the student review his answer to Self-Evaluation 4-11.

02 Core 17

Tells how to identify matter particles in an unknown substance.

The student recalls that matter particles in a substance can be identified by using chemical tests on the substance.

Student Action: Stating in effect that matter particles can be identified by chemical tests.

Performance Check A: You are a famous scientist. A friend wants you to find out what matter particles are in an unknown material which has never been studied before. What would you need to do to identify the matter particles in the unknown material?

Remediation: (1) Have the student review how he would find out if hydrogen (H_2), carbon dioxide (CO_2), iodine (I_2), or copper (Cu) are present in a substance. Questions 3-20, 3-33, 4-25, and 4-33 are critical operational definitions. (2) Have him check his answer to Self-Evaluation 4-2. (3) After the student has reviewed the material, you might show him a crystalline solid on the stock shelf and ask how he could find out whether it contains H_2, CO_2, I_2, or Cu.

02 Core 18

Selects a conclusion consistent with the given data.

The student classifies the matter particles in solutions by their reactions with the specified indicators.

Student Action: Selecting a conclusion consistent with the given data.

A: c
B: d
C: b

Performance Check A: Theron blue turns pink if X matter particles are present. Braten orange turns green if Y matter particles are present. Theron blue solution is put into four test tubes. Braten orange solution is put into four other test tubes. A small amount of solution 1, 2, 3, or 4 is added to each sample of braten orange and theron blue. The results are shown in the table below.

SOLUTION ADDED	THERON BLUE	BRATEN ORANGE
1	turns pink	no change
2	no change	turns green
3	no change	no change
4	turns pink	turns green

Select any of the following which agree with the data in the table.

a. Solutions 1 and 2 contain the same matter particles.
b. Solutions 1 and 3 contain Y type matter particles.
c. Solutions 1 and 4 contain X type matter particles.
d. Solutions 2 and 3 react with theron blue.
e. Solution 4 contains just X type particles.

Remediation: (1) This item is based on the use of indicators to show the presence of substances as is the case with phenol red. By the process of elimination, using the data in the table and the suggested answers, the results should be evident. (2) Have the student review the answers to Self-Evaluations 4-5 and 4-7. This question requires such a high level of abstract reasoning that extensive remediation may produce more frustration than it is worth.

O2
Core
19

Decides whether the number of kinds of matter particles is equal to the kinds of matter.

The student applies the concept that the number of different kinds of matter particles is less than the number of known materials.

Student Action: Stating that there are fewer different kinds of matter particles than of known materials and citing in evidence that many of the materials he has tested contain the same matter particles.

Performance Check A: Suppose that the total number of different materials is known to be one trillion.

1. Is the number of different kinds of matter particles more than, less than, or equal to one trillion?
2. What evidence supports your answer?

Remediation: (1) Have the student check his answer to Self-Evaluation 3-11. (2) Ask him how many things he found that contained copper, iodine, and carbon dioxide. What does the existence of different kinds of matter, each containing the same matter particles, indicate to him? (3) If he proposes a reasonable alternative to the formation of materials by the combination of elemental particles, have him write it down. He should return to his alternative after doing Chapter 8 and try to defend it then.

O2
Exc
3-1
1

Recognizes the implication of the same product from a set of substances reacting with the same reactant.

The student applies the concept that when all of a set of substances produce the same product when reacting with the same reactant, that is evidence that all of the substances in the set contain a common matter particle.

Student Action: Stating that the data imply that vinegar, hydrochloric acid, and lemon juice all contain a common matter particle.

Performance Check A: What do the reactions below indicate to you about the make-up of the three solutions?
hydrochloric acid (solution) + seashells → carbonic acid
lemon juice (solution) + seashells → carbonic acid
vinegar (solution) + seashells → carbonic acid

Remediation: (1) This is a difficult question that is answerable only by taking a concept developed in the chapter and adding to it a concept from this excursion. In the chapter, the idea expressed is that the products of a reaction come from all the reactants. Question the student to see whether he understands this idea, or suggest that he review Figure 3-2, page 32, and the paragraph above it for a clue. In the excursion, the student is asked in each of two cases to keep the liquid constant and check for the presence of one of the contributions to the CO_2 particle from within the solid. In the case of this question, the solid is kept constant and the student is asked to find a common contribution from the liquids. (2) A good remediation for this objective would be a review of Chapter 4 where these ideas are developed.

O2
Exc
4-1
1

Selects the variable to be studied.

The student applies the concept that in an experiment there is a factor whose variation is being studied as a result of changes in the independent variable.

Student Action: Selecting the variable to be studied.
A: Tire mileage
B: Tooth decay
C: Fading of the paint

Performance Check A: There are many variables in the problem below. Name the variable which changes because other things are changed on purpose.

Problem: A tire manufacturer wants to know which of three kinds of cord material will help his tires get the best mileage.

Remediation: Review pages 383 and 384 and, using the problem investigated there, have the student identify the variable which changes because other things were changed on purpose.

O2 Exc 4-1 2

Names factors to be controlled other than the independent variable.

The student applies the concept that in experimental situations there are factors other than the independent variable whose variation must be controlled if the data are to be interpretable.

Student Action: Naming two factors other than the independent variable whose variation must be controlled.

> **A:** Two, such as the following: (1) the type of gasoline, (2) the car used to test the gasoline, and (3) the refinining process.
>
> **B:** Two, such as the following: (1) the type of shampoo base, (2) the manufacturing process, and (3) the seriousness of the dandruff problem on which the testing was done
>
> **C:** Two, such as the following: (1) the type of shoe, (2) the manufacturing process, and (3) the testing conditions

Performance Check A: In the following problem, identify at least two variables which must be kept constant if the experiment is to have usable results.

Problem: A gasoline refiner wants to know which of three additives will cause his gasoline to give the best mileage.

Remediation: (1) Give the student an example in which two or more variables are uncontrolled. To use Performance Check A as an example, suppose that the additives were the same but were used in a Volkswagen, in a Mercury, and in a Cadillac. The Volkswagen gets 25 miles per gallon, the Mercury gets 15 miles per gallon, and the Cadillac gets 10 miles per gallon. What is the effect of the additive on mileage? How could you modify the experiment to get some meaningful results? (2) Have the student review this excursion. (3) If he still misses this item, he may not be ready for this level of abstraction and it will simply take time before he is able to understand the concept.

O2 Exc 4-2 1

Remembers a sensitive test for iodine.

The student recalls that a sensitive test for iodine involves (1) adding a chlorine solution and mineral oil to a solution of a compound which may contain iodine and (2) shaking the resulting mixture well until the released iodine turns the mineral oil pink.

Student Action: Responding with the chlorine solution-mineral oil test for iodine.

Performance Check A: In Excursion 4-2, you learned a new, more sensitive procedure for detecting the presence of iodine. Describe the main parts of that procedure. If you would like to review the less sensitive procedure, you may look at page 55 in your text.

Remediation: Have the student look at his answer to question 5 for the results of mixing iodine and mineral oil and at question 11 for the results of mixing chlorine solution and iodine.

O2
Exc
4-3
1

Explains identical products from different burned substances.

The student applies the concept that a set of substances reacting with the same reactant to produce the same product is evidence that all of the substances contain certain of the same elements.

Student Action: Responding to the effect that carbon is found in many substances.

Performance Check A: In Excursion 4-3, you burned turpentine, Styrofoam, and wood. Each produced soot (carbon), carbon dioxide gas, or both. There are thousands of substances in the world which produce these same results when burned. What conclusion about the contents of these substances can you make?

Remediation: Review the reaction of nitric acid on the nail coating as recorded in Table 4-3. This excursion is an application and expansion of the ideas developed through question 4-16 in the core, namely, that when the same substance is produced from reactants, the reactants contain similar substances.

Chapters 5 and 6

Excursions 5-1 thru 6-3

Performance Check

Summary Table

Objective Number	Objective Description
03-Core-1	Recognizes the relationship between matter and elements
03-Core-2	States the term for substances made up of a single kind of atom
03-Core-3	Names the matter particles which compose all elements
03-Core-4	Selects the diagram that best represents an element
03-Core-5	Recognizes the composition of matter
03-Core-6	Recognizes the number of kinds of atoms for each element
03-Core-7	States the number of substances which cannot be broken down by chemical means
03-Core-8	Draws and explains a diagram of an element
03-Core-9	States how many kinds of atoms are represented by the symbol for an element
03-Core-10	Selects the correct formula for a stated nut and bolt combination
03-Core-11	States the number of particles represented in formulas
03-Core-12	Interprets the numbers in a chemical formula
03-Core-13	States the number of different kinds of particles represented in a formula
03-Core-14	Writes the formulas for the pin-button combinations given
03-Core-15	Uses the conventions of chemical formula writing
03-Core-16	States whether or not a formula contains information about the ordering of atoms
03-Core-17	Indicates the number of different kinds of atoms that may be in a substance
03-Core-18	Explains why many substances but few elements are known

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		✓				applies	
				Q		✓				recalls	
				Q		✓				recalls	
				Q		✓				applies	
				Q		✓				applies	
				Q		✓				applies	
				Q		✓				recalls	
									✓	applies	
				Q		✓				applies	
				Q					✓	applies	
				Q		✓				applies	
				Q					✓	applies	
				Q		✓				applies	
				Q		✓				applies	
									✓	applies	
										applies	
				Q					✓	applies	
								✓	✓	applies	

Objective Number	Objective Description
03-Core-19	Explains how all substances can be made from only about a hundred elements
03-Core-20	States the term for mixtures of solids dissolved in liquid
03-Core-21	Names the process in which solids disappear into a liquid
03-Core-22	States whether atoms are created or destroyed in forming solutions
03-Core-23	Decides whether all parts of a solution contain a dissolved substance
03-Core-24	Heats a substance in a test tube properly
03-Core-25	States what happens to atoms in a chemical reaction
03-Core-26	Explains the lack of reaction of two elements heated together
03-Core-27	Indicates whether atoms are created or destroyed in chemical reactions
03-Core-28	Describes a test for the completeness of a reaction in which a solid forms
03-Core-29	Recognizes the relationship of reactant-product masses
03-Exc 5-1-1	Selects factors involved in naming elements
03-Exc 6-1-1	Calculates the number of particles of solute in a sample of a liquid
03-Exc 6-2-1	Recognizes when a chemical reaction has occurred
03-Exc 6-3-1	States a test for determining whether the atoms of a reagent are used up in a chemical
	reaction
01-Core-2R	States what to do if chemicals spill on someone
01-Core-9R	Selects statements taken from the ISCS particle model

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				recalls	
				Q		√				classifies	
						√				recalls	
						√				applies	
										applies	
	M	O				√				applies	
						√				applies	
										applies	
				Q		√				applies	
									√	applies	
						√				applies	
				Q						applies	
							√			applies	
										applies	
									√	applies	
						√				recalls	
				Q		√				classifies	

Objective Number	Objective Description
01-Core-11R	Selects characteristics of scientific models
01-Core-13R	States two things a scientific model does
01-Core-15R	Indicates that all matter is made up of particles
01-Core-24 thru 28R	(Student's responsibilities)
02-Core-6R	Selects examples of operational definitions
02-Core-10R	Names the reactants and products in a chemical equation
02-Core-11R	Writes a word equation for a chemical reaction
02-Core-14R	Selects a situation using a control
02-Core-16R	States why controls are used in experiments

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		✓				classifies	
						✓				recalls	
				Q		✓				applies	
		O				✓				chooses	
				Q		✓				classifies	
				Q		✓				classifies	
						✓				applies	
				Q		✓				classifies	
						✓				recalls	

O3 Core 1

Recognizes the relationship between matter and elements.

The student applies the concept that all that which is matter is made up of elements or combinations of elements.

Student Action: Designating all entries labeled as being composed of matter as also being made up of elements or combinations of elements. For every M there must be a corresponding E and vice versa. The validity of the material composition of any entry is irrelevant to this objective.

Performance Check A: Copy the list of words below onto your paper. Write E after those things which are made up of elements or combinations of elements. Write M after those things which are made up of matter. You may put an E and an M after the same word.

1. Window glass
2. Leather
3. Wood
4. Space
5. Light

Remediation: (1) The student must first recognize that all substances are matter. If he then recalls that all matter is made up of elements, this question can be answered. Ask for some examples of matter in the room. If responses are not forthcoming, the problem is that the student does not equate matter with substance. (2) In that case, ask which of the items in the performance check he could measure with a balance to find their mass. Ask him what we call things that have mass. If he can't answer, have him do Excursion 2-3 to establish that all matter has mass. (3) A review of page 59 should help him to understand that all matter is made up of elements or combinations of them.

O3 Core 2

States the term for substances made up of a single kind of atom.

The student recalls that elements are substances made up of a single kind of atom.

Student Action: Responding with the term *element*.

Performance Check A: What term is used to name a substance made up of one and only one kind of atom?

Remediation: Refer the student to page 59 of the text, where this information is given.

O3 Core

Names the matter particles which compose all elements.

The student recalls that atoms are the particles which make up an element.

Student Action: Responding with the term *atoms*.

Performance Check A: What is the name of the matter particles which make up elements?

Remediation: This piece of information can only be learned by memorizing it. The fact that atoms make up all matter is stated in the final paragraph of page 59.

3

03
Core
4

Selects the diagram that best represents an element.

The student applies the concept that an element is composed of one and only one kind of atom.

Student Action: Selecting the diagram which uses only one symbol.

A: b
B: d
C: c

Performance Check A: Each different shape in the diagrams below represents a different kind of atom. Which diagram best represents an element?

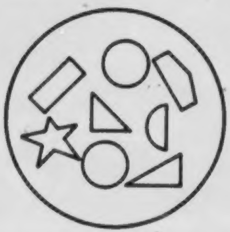


Diagram a

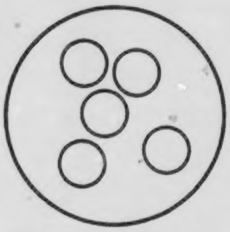


Diagram b

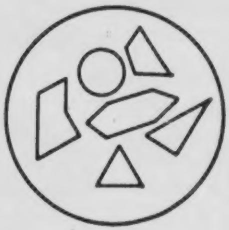


Diagram c

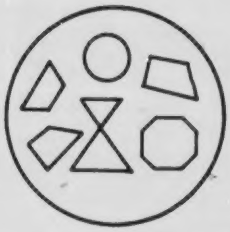


Diagram d

Remediation: (1) First find out if the student understands that elements are made up of one kind of atom. You may have him reread page 59. Ask if the symbols are all alike in any of the examples, as atoms are all alike in any given element. (2) Referring to page 83, ask the student to use Figure 6-1 to get the nuts and bolts that would represent the element lead. (3) Have the student review his answer to Self-Evaluation 5-1.

03
Core
5

Recognizes the composition of matter.

The student applies the concept that all that which is matter is made up of atoms.

Student Action: Designating all entries which he has labeled as being made up of atoms as being composed of matter. For every M which follows an entry, there must be a corresponding A, and vice versa. The validity of the material composition of a particular entry is irrelevant to this objective.

Performance Check A: Copy the list of words below onto your paper. Write M after those things which are matter. Write A after those things which are made up of atoms. You may put both an M and an A after a word.

1. Paper
2. You
3. Ideas
4. Breath
5. Cloth

Remediation: (1) Have the student review the assumption that matter is made up of atoms (particles) as presented on page 7 and in Excursion 1. (2) He may have forgotten the universal application of the concepts that if something has mass it is matter and all matter has mass. Discuss this if his weakness lies here. If he has a mistaken understanding of what constitutes matter, suggest that he review 01-Core-17.

---

03 Core 6

Recognizes the number of kinds of atoms for each element.

The student applies the concept that there is a unique kind of atom for each element.

Student Action: Responding with the number of elements given as the number of kinds of atoms.

A: b
B: d
C: a

Performance Check A: John has samples of 21 different elements. According to the model you and Iggy developed for matter, how many different kinds of atoms does John have?

a. About 6 or 7
b. 21
c. 42
d. Several billion
e. Impossible to tell

Remediation: (1) Ask the student to describe his concept of an element. (2) If he does not have the concept that the kind of particles is unique to an element, have him review page 59 with particular emphasis on the final paragraph. (3) Have him explain how many elements are represented by the answer he chose for this performance check. If he said that it is impossible to tell the number of kinds of atoms, discuss why it is possible to tell.

---

03 Core

States the number of substances which cannot be broken down by chemical means.

The student recalls that there are about one hundred substances which cannot be broken down into other substances by ordinary chemical means.

7

Student Action: Selecting the option which states that there are about one hundred elementary substances.

A: d
B: a
C: b

Performance Check A: How many materials are there that cannot be broken down into other materials by chemical means?

a. About 5
b. About 90,000
c. About 2,000
d. About 100

Remediation: (1) Check to see if the student recognizes this definition of *element.* Faulty definition is the most likely reason for error. (2) It may be that he knows what an element is, but has forgotten how many there are. (3) Have him check his answer to Self-Evaluation 5-2.

O3 Core 8

Draws and explains a diagram of an element.

The student applies the concepts that atoms are matter particles and that an element is composed of a single kind of matter particle.

Student Action: Drawing small particles, reasonably identical in size and shape, and explaining that an element is composed of a single kind of particle of matter.

Performance Check A: Draw a diagram which shows what you would expect to see if a small piece of the element silver were magnified enough for you to see the atoms. Explain your diagram.

Remediation: If the student's representation of atoms are different in size or shape, ask him how the atoms (particles) of an element are different from those of a chemical combination. If he feels that variation of particles does not make any difference, refer him to page 59 where the idea of uniformity is established.

O3 Core 9

States how many kinds of atoms are represented by the symbol for an element.

The student applies the concept that the symbol for an element stands for just one kind of atom.

Student Action: Responding that the given symbol represents a single kind of atom.

Performance Check A: In the formula for calcium chloride ($CaCl_2$), Ca is the symbol for the element calcium. How many kinds of atoms does the symbol Ca stand for?

Remediation: Have the student check his answer to question 5-2 and rethink how he arrived at this answer. This forces him to take another look at the table, which should make it clear to him that each chemical symbol is unique to an element. Have the student check his answer to Self-Evaluation 5-5.

03 Core 10

Selects the correct formula for a stated nut and bolt combination.

The student applies the conventions for stating a chemical formula.

Student Action: Selecting the formula in which the symbol of each element in the combination is shown and the number of units of each kind of particle present in a combination is either indicated as a subscript after the symbol of the particle to which it refers or not shown if there is only one unit of that particle in the combination.

A: c
B: b
C: a

Performance Check A: Iggy has a nut and bolt combination made up of two long bolts (Bo), one yellow nut (Ye), and four green nuts (Gr). Select the formula below which fits Iggy's combination.

a. $2BoYe_4Gr$
b. $2BoYeGr_4$
c. Bo_2YeGr_4
d. $Bo_2Ye_4Gr_2$
e. Bo_4YeGr_2

Remediation: This question is a summary of Chapter 5. Questions 5-27, 5-28, and 5-29 could not have been answered without this concept of formula statements. Have the student review this question with his answers to questions 5-21 through 5-29 before him. If the student selected any of the formulas with a prefix number (coefficient), have him review the paragraph following question 5-26 on page 68. Also, have him review his answer to Self-Evaluation 5-7.

03 Core 11

States the number of particles represented in formulas.

The student applies the concept that in a formula, a symbol represents a single particle of matter and a subscript after the symbol is used to indicate the presence of two or more particles of that type.

Student Action: Responding correctly in at least three of the four cases with the sum of the subscripts, having assumed any unwritten subscripts to be one.

A: 1. 5, 2. 4, 3. 5, 4. 2
B: 1. 5, 2. 4, 3. 2, 4. 4
C: 1. 3, 2. 5, 3. 2, 4. 5

Performance Check A: Don represented four combinations of two kinds of nuts (Re and Gr) and two kinds of bolts (Ye and Bl) by the formulas given below. Write the total number of parts represented in each formula.

1. $GrRe_2Bl_2$ 2. Gr_3Ye 3. Re_3Ye_2 4. GrBl

Remediation: This is an application of question 5-24. The student should review the textual material leading up to this question. Have him check his answer to Self-Evaluation 5-6.

03
Core
12

Interprets the numbers in a chemical formula.

The student applies the conventions of numeration in a formula, that a subscript following a symbol shows the number of particles of that kind present in one unit of the combination, that the coefficient represents the number of units of the combination, and that the mathematical product of the coefficient and the subscript is the total number of particles of a particular kind in the total combination.

Student Action: Stating correctly at least two of the three following numbers: the number of a particular kind of particle in each unit, the number of units of product shown, and the total number of particles of one kind in the number of units stated.

A: 1. 5, 2. 3, 3. 6
B: 1. 3, 2. 2, 3. 4
C: 1. 4, 2. 3, 3. 6

Performance Check A: Jim used the symbols Bl for long bolts and Sq for square nuts. When he put a pile of nuts and bolts together in a certain way, his combination was $3Bl_2Sq_5$.

1. How many square nuts were in each unit of the combination?
2. How many units of the combination did Jim make?
3. How many long bolts were present in the total number of units of the combination formed?

Remediation: Have the student read the last two paragraphs on page 68 and check the correctness of his answer to question 5-27. If this question is wrong, try more examples of problems of this type for practice.

03
Core
13

States the number of different kinds of particles represented in a formula.

The student applies the rule that the number of kinds of particles represented in a chemical formula is the same as the number of different atomic symbols.

Student Action: Stating the number of kinds of particles represented in the formulas.

A: 1. 3, 2. 2
B: 1. 2, 2. 3
C: 1. 3, 2. 2

Performance Check A: Using your knowledge of symbols, formulas, elements, and particles, answer this question. How many different kinds of particles are in each of the following formulas?

1. K_2MnF_6
2. $OsCl_4$

Remediation: If the student muffed this one, he has missed the idea of the notation of atoms expressed in the core. The idea of notation is the basis for all of Chapter 5. Be sure he isn't confused because many elements have two-letter instead of one-letter symbols. Relating the ideas of Chapter 5 to the real world of atoms is done in response to questions 6-30 and 6-31. Have the student review the answers to these two questions and then try an alternate form of this performance check.

---

03 Core 14

Writes the formulas for the pin-button combinations given.

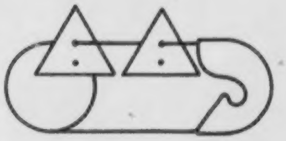
The student applies the conventions of writing chemical formulas.

Student Action: Writing formulas for the pin-button combinations given so that the elements present are represented sequentially, in any order, by their symbols and if the number of atoms of an element in the combination is greater than one, the number of atoms is denoted by a subscript after the symbol of the element to which it refers.

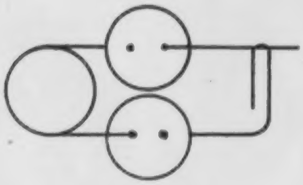
A: 1. $PiTr_2$, 2. $PnRo_2$
B: 1. $PoRu_3$, 2. $PiSc_2$
C: 1. $HoTr_2$, 2. $PiSq_3$

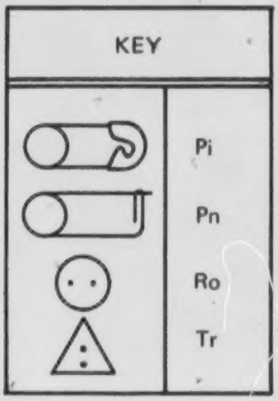
Performance Check A: Using the key shown below, write the formula for each of the two pin-button combinations pictured.

1.



2.





Remediation: This check applies the principle of symbolization of nut and bolt combinations and represents an intermediate step from symbolizing nuts and bolts to symbolizing atoms. Show the student pictures of nut and bolt combinations. Have him review pages 68 and 69 and Self-Evaluation 5-8 and his answer.

---

03 Core

Uses the conventions of chemical formula writing.

The student applies the conventions of chemical formula writing by using the proper symbols and by placing the number of specific units before the symbols of the particles in the unit and the number of a specific type of particle within a unit as a subscript after the symbol that represents the particle.

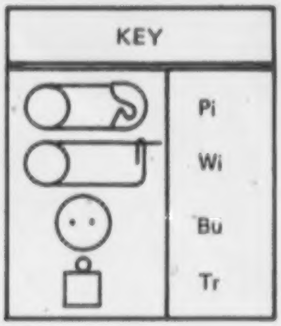
15

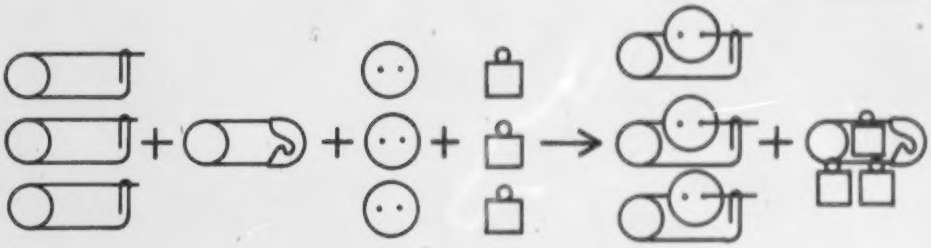
Student Action: Writing a number and symbol description of the reaction.

A: $3Wi + Pi + 3Bu + 3Tr \rightarrow 3BuWi + PiTr_3$
B: $3Pi + 2Wi + 4Bu + 3Tr \rightarrow 2WiBu_2 + 3PiTr$
C: $6Bu + 2Pi + 3Wi + 3Tr \rightarrow 2PiBu_3 + 3WiTr$

The order of the reactants and products is immaterial as long as the reactants are on the left of the *yields* sign and the products are on the right. The ordering of symbols in compounds is also immaterial. For example, A_3B and BA_3 are both to be considered correct.

Performance Check A: Describe the reaction below in terms of symbols and numbers. The key shows the symbols for the pins and buttons used.





Remediation: This is an application of the nuts and bolts problems done in answering questions 5-27 through 5-29. Have the student repeat those questions, thinking of pins and buttons in place of the nuts and bolts. Have the student review Self-Evaluation 5-9. If the student writes, for example, Pi_2Bu_6 when he should have written $2PiBu_3$, ask him how many combinations he has.

O3
Core
16

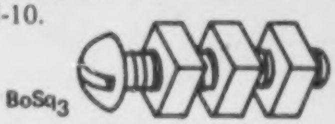
States whether or not a formula contains information about the ordering of atoms.

The student applies the concept that a chemical (molecular) formula states only the elements present in a compound.

Student Action: Responding in effect that a chemical (molecular) formula does not tell the order in which the parts (atoms) are combined.

Performance Check A: Bo_2HxSq_2 is the formula for a nut and bolt combination. What does the formula tell you about the order in which the parts are combined?

Remediation: Give the student the formula $BoSq_3$ and the picture below, and ask whether the formula or the picture shows the order or spacing of the nuts. This is covered by question 5-25 and in Self-Evaluation 5-10.



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03 Core 17

Indicates the number of different kinds of atoms that may be in a substance.

The student applies the concept that it is possible for a substance to be composed of one or more kinds of atoms.

Student Action: Selecting the choice which includes all three or all of the numbers given.

A, B, and **C:** e or a, b, and c

Performance Check A: Select any of the choices below which will complete the sentence. Neal brought a sample of black substance to his science teacher. It is possible that the substance contains ___ kind(s) of atoms.

a. 2
b. 5
c. 1
d. a or c
e. a, b, or c

Remediation: This is an application of the analogy of the nuts and bolts to atoms. Check to see if the analogy is understood. "What do the nuts and bolts represent?" is a good question to ask. Activity 5-1 and question 5-26 focus on the various combinations that can be formed from a few nuts and bolts (atoms).

---

03 Core 18

Explains why many substances but few elements are known.

The student applies the concept that all matter is composed of about one hundred elements or combinations of them.

Student Action: Agreeing with the position that it is possible to identify the elements in any substance and, in his own words, explaining the variety of known substances by the many combinations that can be made from approximately one hundred elements.

A: Agrees with Louie
B: Agrees with Clyde
C: Agrees with Bert

Performance Check A: Louie was given a blue rock and asked to find out which elements were in it. Todd said that it was impossible to identify the elements in the rock because there are millions of different substances, so there must be millions of different elements. Louie said that it is possible to identify the elements in anything.

1. Do you agree with Louie or Todd?
2. Explain why the person you agree with is correct.

Remediation: If the student agrees with the notion that all matter is made up of elements, ask how he explains the thousands of objects that can be formed from only those elements listed in Table 5-1. This idea is wrapped up on page 69, but that statement requires that the student accept the analogy of the nuts and bolts model for chemical combinations. Have the student review his answer to Self-Evaluation 5-13.

---

03 Core 19

Explains how all substances can be made from only about a hundred elements.

The student recalls the concept that the many known substances are made from a small number of different kinds of particles in different combinations.

Student Action: Stating the essence of the concept that the many known substances can be made from a small number of different kinds of particles in different combinations.

Performance Check A: You and Iggy have developed a particle model. It says that only a small number of different kinds of atoms are needed to make all of the substances we know. How can this be true?

Remediation: This idea is stated on page 59 and rephrased in relation to the analogy of nuts and bolts on page 69. Have the student review these two pages. Have him review his answer to Self-Evaluation 5-12.

---

03 Core 20

States the term for mixtures of solids dissolved in liquid.

The student classifies a solution as a mixture formed when one substance dissolves into another.

Student Action: Responding with the term *solution.*

Performance Check A: John dissolved salt in water, instant tea in water, and iodine in alcohol. What are the mixtures John formed called?

Remediation: Have the student read the paragraph immediately under question 6-8 and then tell you whether the examples in the performance check are examples of solutions.

---

03 Core 21

Names the process in which solids disappear into a liquid.

The student recalls that a solid substance dissolves, or goes into solution, when it disappears in a liquid.

Student Action: Responding that the solid is dissolved in the liquid or that the solid goes into solution.

Performance Check A: When solid sodium nitrate is added to water and the two are stirred, the solid disappears. What happens to the solid?

Remediation: This is an application of the answer the student gave to question 6-14. Have him look again at question 6-14 and, if necessary, review the activities preceding this question. Have the student review Self-Evaluation 6-1.

---

03 Core 22

States whether atoms are created or destroyed in forming solutions.

The student applies the concept that if the mass of a material which undergoes a physical change remains constant, the number of atoms in the material is unchanged.

Student Action: Selecting the phrase which indicates that the number of atoms is unchanged and stating the effect of the concept above.

Performance Check A: When 7 grams of solid, blue copper sulfate are dissolved in 32 grams of a liquid, the solid disappears and the liquid becomes bluish. The weight of the solution is 39 grams.

1. The number of atoms present in the 7 g of copper sulfate and the 32 grams of liquid before dissolving is (equal to, greater than, or less than) the number of atoms present in the 39 grams of solution. Choose the phrase in parentheses which completes the sentence correctly.
2. Explain your answer.

Remediation: This is an application of the results of doing Activities 6-5 and 6-6. Check to see if question 6-13 was answered properly. If not, have the student review these activities and the related questions and the answer to Self-Evaluation 6-6.

---

03 Core 23

Decides whether all parts of a solution contain a dissolved substance.

The student applies the concept that a solution is uniform throughout.

Student Action: Responding negatively and in effect that all other samples of the solution would be the same because solutions are uniform throughout.

Performance Check A: Shelly has a beaker of a solution. She tests a 20 ml sample of it and finds that it contains a dissolved solid. She says she cannot be sure if the rest of the liquid contains the dissolved solid because she has tested only a sample.

1. Could other samples of the liquid be different?
2. Explain your answer.

Remediation: Question 6-14 requires an understanding of this concept. Check the student's response to the question to determine whether it states the concept that the crystals must have spread throughout the solution while they were disappearing. The idea of spreading uniformly is the subject of Excursion 6-1. The student should be directed to this excursion if you see from question 6-14 that he thinks the substances which made up the crystals are still concentrated in the water at the point where the crystals lay.

03 Core 24

Heats a substance in a test tube properly.

The student applies the safety rules for heating a substance in a test tube.

Student Action: Pointing the test tube away from himself and other students, using a test tube clamp, moving the test tube back and forth in the flame, and wearing safety glasses.

Regular Supplies:

- lead nitrate
- copper sulfate crystals
- sodium chloride
- calcium chloride
- 1 alcohol burner
- test tube clamp
- safety glasses

Teacher's Note: As your cue to check the student's performance, the student will ask you or your observer to check the amount of material he will heat. The observer can write down the experimental observations for the student being tested as a guise for his observation of the student's safety procedure.

Performance Check A: Cover the bottom of a test tube with blue copper sulfate crystals and sodium chloride. Have your teacher check the amount of the solid you have in the test tube. Use an alcohol burner and any other materials you need, and heat the substance for two minutes. List your observations.

Remediation: Refer the student to the safety notes on page 81 and to any other rules relating to safety practices posted about your room. Point out that these safety practices are to be followed and are not just suggestions.

---

03 Core 25

States what happens to atoms in a chemical reaction.

The student applies the concept that a chemical reaction is a process in which the atoms of the reactant are recombined in new combinations.

Student Action: Responding to the effect that the differences between the properties of reactants and the products of a chemical reaction are due to the atoms of the reactants recombining in new combinations.

Performance Check A: Jerry mixed a blue solution and a colorless solution and produced a solid and a green-blue solution. What happened to the atoms of the reactants to make the products so different from the reactants?

Remediation: To understand this concept, the student must apply the nuts and bolts analogy to chemical combinations, as expressed in Chapter 5. This is done in the steps described in questions 6-30 through 6-33. First check to see if the student understands why he is using nuts and bolts. Then work on any problems of recombinations. You might ask the open-ended question, "What do nuts and bolts have to do with chemical reactions?" Have the student review his answer to Self-Evaluation 6-9.

03 Core 26

Explains the lack of reaction of two elements heated together.

The student applies the concept that individual elements do not necessarily react with all other elements.

Student Action: Responding that he disagrees with the conclusion and stating in explanation the notion that not all elements react with all other elements.

Performance Check A: Bob was given a sample of a white element and a red element. He knew that the white element would react with many other elements. He knew nothing about the red element. He put them both into a test tube and heated them, but no reaction took place. Bob decided that the red element wouldn't react with any element because it did not react with the white element.

1. Do you agree with his conclusion?
2. Explain your answer.

Remediation: This concept was developed in the series of questions beginning with 6-3 and is summarized in question 6-35. The fact that no lead potassium or nitrate iodine is formed is the textual evidence for this concept.

03 Core 27

Indicates whether atoms are created or destroyed in chemical reactions.

The student applies the concept that the number of atoms of an element remains unchanged during a chemical reaction.

Student Action: Selecting the number of atoms of an element present in reactants as being the same as the number of atoms of the element present in the products of a chemical reaction.

A: a
B: b
C: d

Performance Check A: John prepared the following reaction.
zinc + hydrochloric acid → zinc chloride + hydrogen
If there were 755 atoms of zinc used as reactants, how many atoms of zinc are present in the products?

a. Exactly 755
b. Probably 755 plus a few
c. Probably 755 minus a few
d. Impossible to tell
e. Either b or c

Remediation: Ask the student if the mass would change if the number of atoms in the products was more or less than in the reactants. If he says yes or does not know, have him review or repeat Activities 6-5 through 6-8.

O3 Core 28

Describes a test for the completeness of a reaction in which a solid forms.

The student applies the procedure for determining whether the atoms of a specified reagent are used up in a chemical reaction.

Student Action: Responding to the effect that he would add more of the other reagent and, if no more solid formed, he would know that the atoms of the specified reagent were used up.

- **A:** Add more hydrogen sulfide. If no more black solid forms, the silver particles are used up.
- **B:** Add more sulver nitrate. If no more yellow solid forms, the bromide particles are used up.
- **C:** Add more barium iodide. If no more cloudy white solid forms, the sulfate particles are used up.

Performance Check A: When hydrogen sulfide is added to silver nitrate solution, the silver atoms combine with the sulfide particles to form a black solid called *silver sulfide.* Sam mixes a solution of hydrogen sulfide with a solution of silver nitrate. The black solid forms and settles to the bottom. How can Sam find out if all of the reactant silver particles are used up?

Remediation: The rationale for making this sort of test is developed in Excursion 6-3, a short excursion focusing on this concept. Have the student check his answers to Self-Evaluation 6-4 and 6-5.

O3 Core 29

Recognizes the relationship of reactant-product masses.

The student applies the rule that in a chemical reaction the mass of the products is equal to the mass of the reactants.

Student Action: Selecting the option that the reactants' total mass is the same as the mass of the products of the specified reaction and stating as a supporting argument that the mass of the reactants is always equal to the mass of the products in a chemical reaction.

Performance Check A: Jean did the following reaction.

zinc + copper sulfate → 16.1 g zinc sulfate + 6.4 g copper
(22.5 g total product)

1. Select the phrase which makes the following statement true. The mass of the reactants was (greater than, equal to, less than) 22.5 g.
2. Since you weren't there when Jean did the reaction, on what basis could you answer question 1?

Remediation: (1) Have the student review Activities 6-7 and 6-8, as well as questions 6-16 through 6-20 and his responses to them. (2) Have him check his answer to Self-Evaluation 2-3 and explain the correct answer.

O3
Exc
5-1
1

Selects factors involved in naming elements.

The student applies the concept that the wide variety of kinds of names of the elements is the results of many factors, not the result of a deliberate, systematic naming process.

Student Action: Rejecting the statement that the elements were systematically named and selecting any five or more of the other statements.

Performance Check A: The names of the chemical elements come from a wide variety of sources. Select all of the statements below which account for this variety. The elements were named

a. by the people who used them.
b. for the people who discovered them.
c. for famous people.
d. for gods, goddesses, and goblins.
e. for continents, countries, and cities.
f. by a systematic scientific process.
g. using Greek or German names.
h. for their color.
i. for their odor.
j. for their appearance.

Remediation: Refer the student to the first paragraph of Excursion 5-1.

O3
Exc
6-1
1

Calculates the number of particles of solute in a sample of a liquid.

The student applies the concept that when a substance dissolves in a liquid, the particles of the substance are distributed evenly throughout the liquid.

Student Action: Determining the proportionate number of particles in a small sample and stating in effect that the particles of the substance are distributed evenly throughout the liquid.

A: 7,500
B: 15,000
C: 3,000

Performance Check A:

1. If 75,000 particles of sodium are dissolved in enough water to make 100 ml of solution, how many particles of sodium would you expect to find in a 10 ml sample of the solution?
2. State how the particles are distributed in the solution.

Remediation: (1) Check Table 2 on page 81 of the student's *Record Book* to see if the amount of salt for each of the three beakers is the same. (2) If it is not, the student carried out the procedures of Activity 1-4 inaccurately and missed the idea of equal distribution. You may wish either to reason out why his reported results are impossible and the possible reasons for his error or to have him repeat the activity and then do step 3. (3) If Table 2 is correct, ask him how the salt was distributed. Then ask him if the samples in the performance check were divided into X samples, how the particles would be divided.

03
Exc
6-2
1

Recognizes when a chemical reaction has occurred.

The student applies the rule that a chemical reaction has occurred when two or more substances are mixed and at least one of the following occurs: (1) the temperature changes, (2) the color changes, (3) a gas is formed, or (4) a precipitate is formed.

Student Action: Responding correctly in all cases whether or not a reaction has occurred in each case and citing the characteristic changes as evidence of such a change.

A: 1. (a) Yes, (b) A solid is formed.
2. (a) Yes, (b) The color changes.
3. (a) Yes, (b) A gas is formed.
4. (a) No, (b) No chemical reaction occurred.

B: 1. (a) Yes, (b) The color changes.
2. (a) Yes, (b) A solid is formed and the color changes.
3. (a) Yes, (b) A gas is formed.
4. (a) No, (b) No chemical reaction occurred.

C: 1. (a) Yes, (b) A gas is formed.
2. (a) Yes, (b) The color changes.
3. (a) Yes, (b) A solid is formed.
4. (a) No, (b) No chemical reaction occurred.

Performance Check A: For each of the four situations below, write the number of the situation and answer these two questions.

(a) Has the chemical reaction occurred?
(b) How do you know?

Situation 1. A colorless solution of chemical A and a colorless solution of chemical B are mixed. No color change is observed in the solution, no gas is released, and a white solid settles to the bottom of the beaker.

Situation 2. When a clear colorless solution X is added to a colorless solution Y, no gas is released in the glass container in which they are mixed. The solution stays clear but turns yellow. No odor is observed.

Situation 3. When hydrochloric acid is added to a colorless solution, bubbles form and escape, no color change is observed, and no solid forms.

Situation 4. Two solids each form a colorless solution when dissolved in water. When the two solutions are mixed, the resulting solution remains clear and colorless. No gas is given off, and no solid settles to the bottom. There is no temperature change.

Remediation: The answer is based on the student's ability to observe changes while doing the activities. If he answers any part of the question incorrectly, direct him to read through Excursion 6-2. If he still feels he does not understand, have him repeat the activities. If his answer is partially correct, refer him to the corresponding activities in Excursion 6-2. Review the answer to Self-Evaluation 6-2.

O3
Exc
6-3
1

States a test for determining whether the atoms of a reagent are used up in a chemical reaction.

The student applies the laboratory procedure for determining whether or not the atoms of a reagent are used up in a chemical reaction.

Student Action: Responding that he would add more AB and if the precipitate formed, the D atoms were not used up when the original solutions AB and CD were mixed and formed a precipitate AD.

- **A:** Add more hydrochloric acid. If more precipitate formed, the silver particles were not used up.
- **B:** Add more barium chloride. If more precipitate formed, the sulfate particles were not used up.
- **C:** Add more hydrogen sulfide. If more precipitate formed, the cadmium particles were not used up.

Performance Check A: When hydrochloric acid is added to silver nitrate, the silver atoms combine with the chloride particles. A white solid, called *silver chloride,* forms. Ken mixes 4 milliliters of HCl with 4 milliliters of silver nitrate. The white solid forms and settles to the bottom. Explain how he could find out if all of the reactant silver particles are used up.

Remediation: (1) The problem here may be that the student did not see the principle involved in the excursion. The assumption made in this excursion is that solution X still contains atoms, but this fact may be glossed over. Ask the student if he realizes that fact. Also ask him if there are any atoms of silver (or sulfate or cadium) left in the solution? (2) A concept that is critical to the solution of these problems is that the reactants in a solution will continue to react until one or both are used up. Question 6-38 is based on this concept. The student should be able to accept this idea before repeating the excursion.

Objective Number	Objective Description
04-Core-1	Judges an assumption about the combination of given elements
04-Core-2	Relates the number of dissolved atoms to the volume of solution
04-Core-3	Uses the concept that atoms combine in definite numbers
04-Core-4	Predicts leftover atoms from nut and bolt models
04-Core-5	Tells how to find out if certain atoms are used up during a chemical reaction
04-Core-6	Indicates which variable is to be controlled in a described procedure
04-Core-7	Suggests how to tell if certain atoms are used up in a gas-producing reaction
04-Core-8	Uses the rule of definite combining numbers (ratios)
04-Core-9	Defines the term *compound*
04-Core-10	Recognizes the makeup of compounds
04-Core-11	Judges the grounds for rejecting alternatives to a model
04-Core-12	Recognizes a description of matter that contains only one kind of atom
04-Core-13	Selects the characteristics of scientific models
04-Core-14	Recognizes the limitations of model acceptance
04-Core-15	Recognizes the reason for basing conclusions on many cases
04-Core-16	Selects components of a chemical system
04-Core-17	Selects subsystems of systems
04-Core-18	Uses a thermometer, following accepted procedure

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				applies	
				Q			√			applies	
						√				applies	
				Q		√				generates	
						√				applies	
				Q		√				classifies	
										applies	
			P	Q	T	√				applies	
						√				recalls	
				Q		√				classifies	
						√				applies	
				Q						classifies	
				Q		√				recalls	
				Q		√				applies	
						√				applies	
				Q					√	classifies	
				Q					√	classifies	
	M	O			T	√				manipulates	

Objective Number	Objective Description
04-Core-19	States the rule of the combination of atoms in definite numbers (ratios)
04-Core-20	Uses ISCS materials to measure mass
04-Core-21	Cites evidence of chemical reactions in experiments
04-Core-22	Recognizes from descriptions when a chemical reaction has occurred
04-Core-23	States the meaning of the symbol Δ
04-Core-24	Recognizes why the amounts of a product [illegible] the same in several trials
04-Core-25	States a test for unreacted particles in a heat-releasing reaction
04-Core-26	Recognizes that elements in compounds are combined in definite numbers (ratios)
04-Core-27	Calculates the number of atoms in a formula with a coefficient
04-Core-28	Tells what happens to particles during a reaction
04-Core-29	Explains the relationship between the elements in the reactants and the products
04-Exc 7-1-1	Judges extrapolated values of various ranges beyond the range of the given data
04-Exc 7-1-2	Plots data and draws best-fit lines
04-Exc 7-1-3	Selects graphs which show two variables increasing together
04-Exc 7-1-4	Selects graphs showing only one variable remaining constant
04-Exc 7-1-5	Extrapolates and interpolates from a graph
04-Exc 7-2-1	Lists solutions in order of concentration
04-Exc 7-2-2	Calculates the concentration of a solution in grams per milliliter

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						✓				applies	
	M	O	P		T	✓				manipulates	
	M		P		T	✓				applies	
				Q		✓				applies	
				Q		✓				classifies	
						✓				applies	
						✓				applies	
						✓				applies	
				Q						applies	
						✓				applies	
						✓				applies	
						✓				applies	
			P	Q		✓				applies	
				Q		✓				classifies	
				Q		✓				classifies	
				Q		✓				applies	
				Q						classifies	
				Q			✓			applies	

Objective Number	Objective Description
04-Exc 7-2-3	Calculates the weight of a solute in a sample of a solution
04-Exc 8-1-1	Handles a thermometer, using the accepted procedure
04-Exc 8-2-1	Names a method for recovering an unseen product
04-Exc 8-3-1	Recognizes the product of a reaction involving an atom team
01-Core-24 thru 28R	(Student's responsibilities)
02-Core-10R	Names the reactants and products in a chemical equation
02-Core-11R	Writes a word equation for a chemical reaction
02-Core-17R	Tells how to identify matter particles in an unknown substance
03-Core-10R	Selects the correct formula for a stated nut and bolt combination
03-Core-14R	Writes the formulas for the pin-button combinations given
03-Core-18R	Explains why many substances but few elements are known
03-Core-23R	Decides whether all parts of a solution contain a dissolved substance
03-Core-25R	States what happens to atoms in a chemical reaction
03-Core-27R	Indicates whether atoms are created or destroyed in chemical reactions
03-Core-29R	Recognizes the relationship of reactant-product masses

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q			✓			applies	
	M	O					✓			manipulates	
										applies	
				Q						classifies	
		O				✓				chooses	
				Q		✓				classifies	
						✓				applies	
						✓				recalls	
				Q		✓				applies	
				Q		✓				applies	
						✓				applies	
						✓				applies	
						✓				applies	
				Q		✓				applies	
						✓				applies	

04 Core 1

Judges an assumption about the combination of given elements.

The student applies the concept that not every element combines with every other element.

Student Action: Disagreeing with the stated position and stating the essence of the concept.

Performance Check A: Jack observed the following two reactions.

$2K + I_2 \rightarrow 2KI$
(element) (element) (compound)

$Cu + Cl_2 \rightarrow CuCl_2$
(element) (element) (compound)

He concluded that the elements potassium (K), iodine (I), copper (Cu), and chlorine (Cl) do react, and therefore the following reactions will occur.

$K + Cu \rightarrow KCu$
$Cu + I_2 \rightarrow CuI_2$
$Cl_2 + I_2 \rightarrow 2ClI$
$2K + Cl_2 \rightarrow 2KCl$

1. Do you agree or disagree with Jack?
2. Why?

Remediation: The statement is made on the first page of Chapter 7 that not every kind of atom combines with every other kind of atom. (1) Check to see if the student remembers that elements are made up of only one kind of atom. (2) Apply the statement quoted above to elements.

04 Core 2

Relates the number of dissolved atoms to the volume of solution.

The student applies the concept that the ratio of the atoms in two samples of a solution is in the same ratio as their volumes.

Student Action: Selecting the answer given by the formula:

$$\frac{\text{specified volume of unknown}}{\text{specified volume of known}} \times \text{known number of atoms} = \text{unknown number of atoms}$$

A: c
B: d
C: a

Performance Check A: George has a bottle of chloride solution. He puts 2 ml of the solution into a test tube and 10 ml of it into a beaker. There are 20 chloride atoms in the 2 ml of solution in the test tube. How many chloride atoms are in the beaker?

a. You can't tell.
b. 20
c. 100
d. 200
e. 2,000

Remediation: (1) Questions 7-7 and 7-8 deal with this concept. (2) If the student made a mistake in his calculations, simply have him redo them. (3) If he just doesn't understand, have him try Excursion 7-2. (4) Also have him review Self-Evaluation 7-13.

O4 Core 3

Uses the concept that atoms combine in definite numbers.

The student applies the law of definite composition (combining proportions) that in compounds the atoms of different elements are combined with each other in definite numbers (ratios).

Student Action: Responding affirmatively and stating that the predictions can be made because the elements combine with each other in definite numbers.

Performance Check A: In tests, Dan found that 4 particles of calcium react with 8 particles of chlorine, producing 4 particles of calcium chloride.

1. If Dan is given 10 particles of calcium, can he predict the number of particles of chlorine needed to use up all the calcium particles?
2. Can he predict how many particles of calcium chloride will be produced?
3. Explain your answers.

Remediation: (1) It's back to the nuts and bolts if a student is having trouble with this one. (2) Let him use a set of them in attempting to answer this question. (3) The nut and bolt model was first tested in a chemical system in Activity 7-4. Direct the student to this section of the text for review.

O4 Core 4

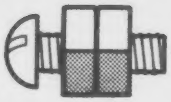
Predicts leftover atoms from nut and bolt models.

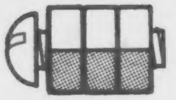
The student generates correct predictions from nut and bolt combinations of excess reactant atoms in a given reaction.

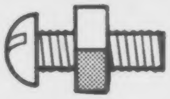
Student Action: Selecting those and only those combinations which correctly predict excesses of the specified particles.

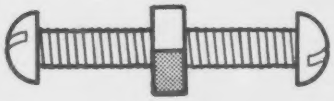
A: a and b
B: d
C: b and c

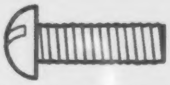
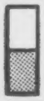
Performance Check A: Jack has two solutions. One contains silver particles, and the other contains chloride particles. Suppose each ml of the chloride solution contained 5 chloride particles, and each ml of the silver solution contained 5 silver particles. He mixes 10 ml of the solution containing silver particles with 10 ml of the solution containing chloride particles. Select any of the combinations below which would cause you to predict that chloride particles would be left over.

a.


b.


c.


d.


KEY	
	Chloride particle
	Silver particle

Remediation: (1) Provide the student with nuts and bolts and tell him to combine them as suggested. (2) Have him review or redo Table 7-3.

04 Core 5

Tells how to find out if certain atoms are used up during a chemical reaction.

The student applies the procedure for determining whether or not the atoms of a specified reagent are used up in a two-reagent chemical reaction as adding more of the other reagent and looking for evidence of further reaction.

Student Action: Responding that he would add more of the reagent or reagents which does not contain the particle being tested for. If more solid forms, the atoms being tested for were not used up.

A: Add more sodium chloride. If no more solid forms, the lead particles were used up.

B: Add more copper nitrate. If no more solid forms, the sulfide particles were used up.

C: Add more zinc iodide. If no more solid forms, the sulfide particles were used up.

Performance Check A: A solution of sodium chloride is added to a solution of lead nitrate. The lead and the chlorine atoms form a white solid, lead chloride, which settles to the bottom. How could you find out if all the lead particles in the lead nitrate solution are used up?

Remediation: (1) Excursion 6-3 defines this procedure. Activity 7-5 is an application of it. Have the student review these two examples. (2) Check his answers to questions 7-11 and 7-12. (3) Have the student review Self-Evaluation 7-1 and explain the correct answer.

Indicates which variable is to be controlled in a described procedure.

O4 Core 6

The student classifies time as the variable whose variations must be controlled if the specified data are to be valid.

Student Action: Stating that time is a variable to be controlled.

Performance Check A: In Chapter 7, you heated the six test tubes with the yellow solid in them. Then you were given the following directions:

> Measure, in millimeters, the height of the yellow solid that has formed in each tube. The height of the pile of solid indicates the amount of product formed. The longer you wait to make the measurements, the more the solid will settle. Therefore, do your measuring today. And measure all the tubes as quickly, yet as carefully as you can.

What variable do these directions tell you must be controlled if the results of your activity are to be useful?

Remediation: (1) Check to see if the student understands the meaning of the word *variable*. If not, define or explain it for him. (2) There is good practice in identifying variables in the Checkup on page 47 and in Excursion 4-1.

Suggests how to tell if certain atoms are used up in a gas-producing reaction.

O4 Core 7

The student applies the procedure of adding more of the other reagent to determine if the particles of a reagent were used up in a gas-producing chemical reaction.

Student Action: Responding that he would add more of the other reagent. If more gas forms, the particles of the reagent being checked for are not used up.

- **A:** Add more HCl. If more gas is given off, the washing soda particles are not used up.
- **B:** Add more vinegar. If more gas is given off, the bicarbonate of soda particles are not used up.
- **C:** Add more sour milk. If more gas is given off, the baking soda particles are not used up.

Performance Check A: HCl was added to a solution of washing soda solution. The washing soda particles reacted, and bubbles of carbon dioxide gas were given off. How could you find out if there were any more unreacted washing soda particles left?

Remediation: (1) This question is asked in another way in question 6-36 where lead nitrate and potassium iodide were being mixed. Have the student rethink this question. (2) Excursion 6-3 is based on this idea of adding more of a reactant to see if the particles are used up. (3) Review with the student his interpretations of the results of Activity 7-4 and Self-Evaluation 7-1, which are based on this idea.

04
Core
8

Uses the rule of definite combining numbers (ratios).

The student applies the rule of combining definite numbers (ratios) – when a reactant has been exhausted by combining in a definite proportion, the reaction stops.

Special Preparations: You should have graph paper ready – each student will need ¼ of an 8 x 10 sheet – or appropriately labeled reproductions of the grid below.

Student Action: Selecting the cases in which a reactant, B, is in excess as those in which a fixed increase in the amount of reactant A produces a proportional change in the amount of product and those cases in which reactant A is in excess as those in which the proportional difference in the amount of the product is not observed for a fixed amount of increase for reactant A.

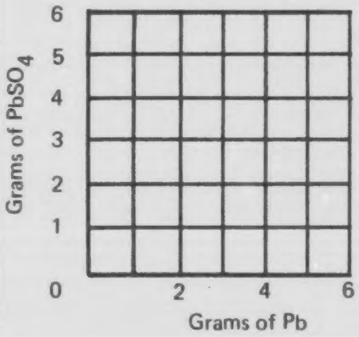
A: 1. Trials 4, 5, and 6
    2. Trials 1, 2, and 3
B: 1. Trials 5 and 6
    2. Trials 1, 2, 3, and 4
C: 1. Trials 1 and 2
    2. Trials 3, 4, 5, and 6

Performance Check A: Julie combined lead and sulfuric acid in the following reaction. Her data for six trials appear in the table below.

$$Pb + H_2SO_4 \rightarrow PbSO_4 + H_2$$

(lead) (sulfuric acid) (lead sulfate) (hydrogen)

TRIAL	AMT. OF Pb (in g)	AMT. OF H_2SO_4 (in ml)	AMT. OF $PbSO_4$ (in g)
1	1	28	1.5
2	2	28	3.0
3	3	28	4.5
4	4	28	5.0
5	5	28	5.0
6	6	28	5.0



Study the table, and answer the following questions. If it will help you, get a piece of graph paper and plot the data on a grid like the one shown.

1. In which trials is there an excess of Pb?
2. In which trials is there an excess of H_2SO_4?

Remediation: (1) Review the student's use of graphing. The use of a graph to solve this type of problem is covered in the response to question 7-15. (2) Check to see if the student understands what is meant by leftovers. If not, refer him to Excursion 6-3. (3) Another difficulty may result from the use of the SO_4 particle. Explain that this team of atoms acts much like a single atom in that it often combines in a selective manner and does not combine with all kinds of atoms (see Excursion 8-3).

04
Core
9

Defines the term *compound.*

The student recalls the definition that a compound is a substance which is composed of more than one kind of atom combined in definite numbers.

Student Action: Writing the effect of that definition of *compound.*

Performance Check A: Write a definition of *compound* as it is used in the following sentence. Copper sulfate ($CuSO_4$) is a compound.

Remediation: (1) Have the student check his answers to Self-Evaluations 7-3 and 7-8 to establish the notion of compounds as combinations of elements. (2) Refer the student to the boxes at the bottom of page 104 and page 127 to establish the notion of combinations in definite numbers (ratios). (3) A drill can be prepared listing atoms, elements, and compounds for the student to identify. Place the answers upside down at the bottom of the page or tell him where the answers can be found.

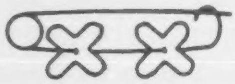
04
Core
10

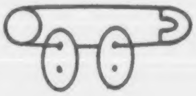
Recognizes the makeup of compounds.

The student classifies the individual symbols used in a diagram of a compound as representing the elements which make up compounds.

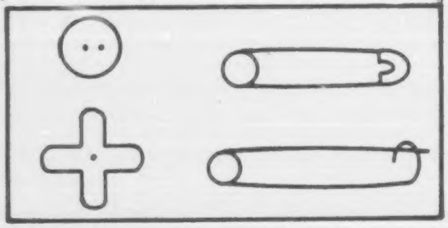
Student Action: Responding either "element" or "atom."

Performance Check A: Each of the two combinations below represents a different compound.





If the diagrams above represent compounds, what does each symbol in the box below represent?



Remediation: (1) Have the student review the blue shaded box on page 104. (2) This is a variation of the nut and bolt idea. You might suggest that the student think of these items as nuts and bolts. Have him look at Figure 7-1, page 88. If the nut and bolt atoms singly represent elements, be sure he sees that the nut-bolt combinations represent compounds. (3) Have the student explain his answers to Self-Evaluations 7-3 and 7-8.

04 Core 11

Judges the grounds for rejecting alternatives to a model.

The student applies the concept that there can be more than one model for a set of observations.

Student Action: Disagreeing with the action taken and stating the essence of the concept.

Performance Check A: Alice developed a model that explained all the observations involving gravity in terms of a particle, which she called a *graviton*. When three other students brought Alice their models, which they said also explained all observations involving gravity, Alice refused to review them. She remarked, "Your models can't be good. They are different from mine, and everybody knows mine works."

1. Do you agree with Alice's reason for not looking at the other models?
2. Explain your answer.

Remediation: (1) The student may have missed this point. It has not been flatly stated, only implied by the ISCS particle model in the last section of Chapter 7, pages 104 and 105. (2) If he has not done Excursion 1-1, refer him to it now.

04 Core 12

Recognizes a description of matter that contains only one kind of atom.

The student classifies matter which is composed of one and only one type of atom as an element.

Student Action: Stating that the material in question is an element.

Performance Check A: Suppose Iggy has become so small that he can walk between atoms in a material. Iggy is lost inside a chunk of material because all the atoms look exactly alike. What sort of a material is Iggy lost in?

Remediation: (1) Have the student review Self-Evaluation 7-7. (2) This idea is based on information on page 59. It is restated on pages 104, 105, and 127.

04 Core

Selects the characteristics of scientific models.

The student recalls the concept that the models which scientists use are better described as useful than as correct.

13

Student Action: Selecting the statement that agrees with the concept above.
A: d
B: a
C: b

Performance Check A: Write the letter of the best statement below about the models that scientists use.

a. A model is thrown out when it does not predict or explain a new observation because it has been shown to be incorrect or incomplete.
b. Models used by scientists provide only right answers.
c. The models used by scientists state what actually happens in nature and are therefore correct.
d. It is not known if the models used by scientists are correct, but they are used because they help explain and predict observations.

Remediation: (1) This concept is repeated throughout the Level II program and given emphasis from time to time, as on pages 104 and 105. (2) Have the student do or review Excursion 1-1. (3) Have the student compare his answer to Self-Evaluation 7-12 with the answer options for the check.

04
Core
14

Recognizes the limitations of model acceptance.

The student applies the concept that acceptance of a model imples only that it explains most observations made to date.

Student Action: Selecting the entry involving the explanation of observations.
A: d
B: a
C: c

Performance Check A: Suppose that all scientists were to accept a particle model for sound. This would mean that

a. scientists had direct proof that sound exists as particles.
b. at least the best scientists have seen sound particles.
c. sound is exactly like matter particles.
d. thinking about sound as though it is made up of tiny particles had explained most of the observations made to that date.
e. no other model could explain the observations made to that date.

Remediation: (1) This idea is reinforced in nearly all chapters. The best single remedial reference is Excursion 1-1. (2) This idea is repeated and illustrated on the last page of Chapter 7.

04

Recognizes the reason for basing conclusions on many cases.

The student applies the concept that a single case often does not give sufficient evidence upon which to base a conclusion.

Core 15

Student Action: Responding to the effect that a single case often does not give enough evidence upon which to base a conclusion.

Performance Check A: In your text, you were asked whether atoms combine with each other in definite numbers. You said yes after experimenting with lead iodide (PbI_2). Then, instead of being asked a different question, you were asked to answer the same question working with copper sulfate ($CuSO_4$) and zinc (Zn). Why was it necessary to answer the question more than once?

Remediation: This is an application of the story of Harry the fisherman, described on page 107. This idea of the need for more than one test is alluded to in the last paragraph of page 108 and the first paragraph of page 109.

04
Core 16

Selects components of a chemical system.

The student classifies individual elements or compounds of the reaction as components.

Student Action: Selecting the individual compounds or elements listed.

A: d and e
B: c and e
C: b and d

Performance Check A:

SYSTEM

zinc + hydrochloric acid → zinc chloride + hydrogen
(metal) (colorless solution) (colorless solution) (colorless gas)

List the letters of any of the following which represent a component of the above system.

a. zinc + hydrochloric acid
b. zinc + hydrochloric acid → zinc chloride + hydrogen
c. zinc + hydrochloric acid → hydrogen
d. zinc chloride
e. zinc

Remediation: (1) If the student selects one of the subsystems because of the stated definition that a component is a part of a system, review page 108 with him, stressing that a component is a single part of the system. (2) Have the student explain Self-Evaluation 8-4c. (3) Have him do an alternate check.

04

Selects subsystems of systems.

The student classifies as a subsystem a group of components or a part of a system being isolated for study.

Core 17

Student Action: Selecting at least two of the three groups of interacting components which are less than the whole system.

A: a, c, d
B: a, c, e
C: b, d, e

Performance Check A:

SYSTEM

sodium sulfide	+ silver nitrate	→ sodium nitrate	+ silver sulfide
(colorless solution)	(colorless solution)	(colorless solution)	(black solid)

List the letters of any of the following which represent subsystems of the above system.

a. silver + sulfide → silver sulfide
b. sodium
c. sodium sulfide + silver nitrate
d. sodium nitrate + silver sulfide
e. sodium sulfide + silver nitrate → sodium nitrate + silver sulfide

Remediation: (1) This idea of systems and subsystems is a natural carry-over from Level I where it is a major theme of the course. The Level II student is introduced to the idea on page 108, which should give enough information to teach the concept. (2) Have the student review and explain the answers to Self-Evaluation 8-4b. (3) Let the student do an alternate performance check with an open book.

04
Core 18

Uses a thermometer, following accepted procedure.

The student manipulates the thermometer, using the following accepted procedure: (1) places the thermometer into the water so that it does not touch the bottom of the beaker, (2) waits for the fluid in the thermometer to adjust, (3) puts his eye level with the top of the fluid when taking a reading, and (4) reads the temperature with the bulb of the thermometer submerged.

Regular Supplies:	1 alcohol burner	1 Celsius thermometer
	1 250-ml beaker	1 burner support stand
		water

Student Action: Performing all four of the specified operations and reporting the temperatures to within 1°C of the values read by an observer.

Performance Check A: Get the following equipment:

1 alcohol burner
1 250-ml beaker
1 Celsius thermometer
1 burner support stand
150 ml of water

Get your teacher or an appointed observer to watch you. Use the burner to heat the 150 ml of water. While the water is heating, measure and record its temperature every minute for three minutes.

Remediation: (1) The student who misses this should review the Checkup on page 116. (2) Suggest that he do or review Excursion 8-1.

---

04 Core 19

States the rule of the combination of atoms in definite numbers (ratios).

The student applies the rule that atoms combine in definite numbers (ratios).

Student Action: Indicating that he agrees with the concept that atoms combine in definite numbers (ratios) and stating as a reason that atoms combine in definite numbers (ratios).

A: Agree with Bill
B: Agree with Tom
C: Agree with Debbie

Performance Check A: Bill found in a reaction that for every atom of calcium (Ca), two atoms of iodine (I) were used. He decided that one atom of Ca always combines with two atoms of I. But Sue said that the number of I atoms that combine with an atom of Ca would be different if Bill had started with different amounts of Ca and I.

1. Do you agree with Bill or Sue?
2. Why?

Remediation: (1) The student can be referred both to Table 7-7 and to Table 8-1. (2) Ask whether the concept involved in this check is the procedure of holding the amount of one substance constant and varying the amounts of the other. What effect did this procedure produce in the tables? Why?

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04 Core 20

Uses ISCS materials to measure mass.

The student manipulates the given materials according to the procedure in which he (1) places approximately equal amounts of paper in both balance pans, (2) zeros the balance, (3) places the X-gram mass on the paper in one pan, (4) adds small amounts of the solid to the paper in the pan until the pointer is at the zero position, and (5) removes the papers and gram masses.

Regular Supplies:

paper
a set of masses (grams)
splints
double-pan balance

Special Preparation: Place any inexpensive and readily available granular material such as salt, sugar, or baking powder in a bottle labeled 04-Core-20. Since contamination is not a problem in this instance you may return the students' samples to bottle 04-Core-20.

Student Action: Performing each step above to the satisfaction of the observer.

Performance Check A: Ask the teacher to watch you do this performance check. Get bottle 04-Core-20 and weigh out 3 grams of the white solid. You may use any equipment you need.

Remediation: (1) Refer the student to Excursion 2-1 which teaches handling and zeroing the balance. (2) The use of paper and splints to protect the pans and simplify the transfer of the measured substances is described in Activities 8-9 through 8-11.

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04 Core 21

Cites evidence of chemical reactions in experiments.

The student applies the concept that observable changes are evidence that a chemical reaction has taken place.

Regular Supplies:	5 stirring rods 8 dropper bottles	5 test tubes

Special Preparations: Place dropper bottles of each of the following solutions, designated by the accompanying letters, in box 04-Core-21. You can use solutions mixed according to recipes on pages T 26 through T 30 of the Teacher's Edition of *Probing the Natural World/2.*

A. 3.0 M HCl (p. T 27)
B. water
C. vinegar
D. 1.0 M NaCl (p. T 29)
E. $NaHCO_3$ (3 tsp/100 cc) (baking soda, local supply)
F. 3.0 M NaOH (p. T 29)
G. 1.0 M $CuSO_4$ (p. T 27)
H. 0.1 M $BaCl_2$ (p. T 26)

Student Action: Indicating that a reaction has occurred when two solutions are mixed and (1) the temperature changes, (2) the color changes, (3) a gas is released, or (4) a precipitate is formed and citing the observed evidence.

A: 1. (a) Yes, (b) The temperature changes.
2. No
3. (a) Yes, (b) A precipitate forms.
4. No
5. (a) Yes, (b) A gas forms.

B: 1. No
2. (a) Yes, (b) The temperature changes.
3. (a) Yes, (b) A precipitate forms.
4. (a) Yes, (b) A gas is released.
5. No

C: 1. No
2. No
3. (a) Yes, (b) A gas is released.
4. (a) Yes, (b) A precipitate forms.
5. (a) Yes, (b) The temperature changes.

Performance Check A: In box 04-Core-21 you will find eight solutions labeled A through H. Get five test tubes and any equipment you need. Mix the solutions as shown in the table below. For each numbered mixture, tell

(a) whether or not a reaction takes place and
(b) if there is a reaction, state the evidence for it.

MIXTURE	½ DROPPER + ½ DROPPER	
1	A	F
2	C	A
3	G	H
4	H	B
5	C	E

Remediation: (1) Refer the student to Excursion 6-2 which deals with recognizing reactions. If you feel that a student has been asked to do too many excursions, have him review the following as needed: Activity 1-2 for gas formation, Activities 4-7 through 4-9 about color change, Activity 7-3 which relates to perception formation, and Activity 8-13 on temperature change. (3) Have the student review Self-Evaluation 8-1.

04 Core 22

Recognizes from descriptions when a chemical reaction has occurred.

The student applies the rule that a chemical reaction has occurred when two or more substances are mixed and at least one of the following occurs: (1) the temperature changes, (2) the color changes, (3) a gas is formed, or (4) a precipitate is formed.

Student Action: Stating in each case whether or not a reaction has occurred and citing one or more of the characteristic changes as evidence of a reaction.

A: 1. (a) Yes, (b) The temperature changes, and a solid is formed.
2. (a) Yes, (b) The temperature changes.
3. (a) Yes, (b) A gas is formed.
4. No chemical reaction occurred.

B: 1. (a) Yes, (b) The temperature changes.
2. (a) Yes, (b) A precipitate is formed, and the color changes.
3. No chemical reaction occurred.
4. (a) Yes, (b) A gas is formed.

C: 1. (a) Yes, (b) The temperatue changes, and a solid is formed.
2. No chemical reaction occurred.
3. (a) Yes, (b) A gas is formed.
4. (a) Yes, (b) The temperature changes.

Performance Check A: For each situation below:

(a) state whether or not a reaction has occurred and
(b) if a reaction has occurred, state the evidence of the reaction.

Situation 1: Two colorless solutions are mixed. No color change is observed in the resulting solution. The test tube gets hot, no gas is released, and a white solid settles to the bottom of the beaker.

Situation 2: When clear, colorless solution X is added to colorless solution Y, the glass container in which they are mixed grows very warm, no gas is released, the solution stays clear and colorless, and no odor is observed.

Situation 3: When hydrochloric acid is added to a colorless solution, bubbles form and escape, no color change is observed, and no solid forms.

Situation 4: Two white solids both form colorless solutions when they are dissolved in water. When the two solutions are mixed, the resulting solution remains clear and colorless. No gas is given off, and the temperature doesn't change. No solid settles to the bottom.

Remediation: The student should know several evidences of a reaction at this point. Refer him to the following activities as needed: (1) Activity 1-2 (gas bubbles produced), (2) Activities 4-7 through 4-9 (color changes), (3) Activity 7-3 (precipitate formation), (4) Activity 8-13 (temperature change).

Excursion 6-2, which is concerned with recognizing reactions, may be useful to the student who missed this check. See also Self-Evaluation 8-1 and 8-6.

04
Core
23

Recognizes why the amounts of a product are the same in several trials.

The student applies the concept that substances combine chemically in definite numbers (ratios).

Student Action: Responding that the amount of the product is the same in each trial because the amount of the limiting reactant is the same in each trial and reactants always combine in a definite number (ratio).

Performance Check A: Examine the table below which shows the data collected in three trials.

TRIAL	MASS OF RED REACTANT	MASS OF GREEN REACTANT	MASS OF PRODUCT
1	2 g	95 g	3 g
2	2 g	125 g	3 g
3	2 g	140 g	3 g

Notice that in each trial the amount of the green reactant changes. Yet the product is exactly 3 g in each case. Explain why.

Remediation: (1) Check to see if the student's problem is interpreting the table. Try asking him where the product came from. Excursion 7-1 on interpreting graphs and the last three pages of Chapter 7 have the student interpret similar data so he may very well be familiar with the concept but not recognize it in tabular form. Perhaps the student just needs practice in interpreting tables. (2) Activity 7-4 is based on this objective. Review of this activity and the surrounding textual material should help. (3) Activity 7-5 is a test of suspected leftovers. This is a crucial idea that is applied to problems in Chapter 8. (4) The graph in Figure 8-5 of the *Record Book* deals with a similar case of leftover atoms. Expect to invest some time interpreting that material with a student having difficulty; the idea may be elusive.

---

04 Core 24

States the meaning of the symbol Δ.

The student classifies the measurement of Δ *variable* as a measurement of a change in the variable.

Student Action: Stating a change in the specified variable.

A: Change in height
B: Change in mass
C: Change in length

Performance Check A: If h is the symbol used for height and you were asked to measure Δh, what would you measure?

Remediation: This is stated on page 120 in the first and second paragraphs. The definition of *delta* (Δ) is given there, and if the student has not learned it, he should do so now.

---

04 Core 25

States a test for unreacted particles in a heat-releasing reaction.

The student applies the procedure of adding more of the other reagent or reagents and looking for further change in temperature to determine whether the particles of a reagent were used up in a chemical reaction that gave off heat.

Student Action: Responding that he would add more of the reagent not being tested for and if a further temperature increase results, the particles tested for were not used up.

A: Add more hydrochloric acid (HCl). If the temperature increases, the lye particles were not used up.
B: Add more drain cleaner. If the temperature increases, the sludge particles were not used up.
C: Add more vinegar. If the temperature increases, the particles of milk of magnesia were not used up.

Performance Check A: A solution of lye particles and hydrochloric acid (HCl) were mixed. The HCl and the lye particles reacted. The temperature of the reacting solutions went up 5°C. How could you tell if there were still lye particles that had not reacted?

Remediation: (1) Have the student look at the graph he drew on Figure 8-5 of his *Record Book* and ask him what would happen to the temperature if more zinc had been added to trial 2 and to trial 5. (2) If he is still uncertain, have him try adding more zinc to these jars. (3) If the student seems uncertain of the procedure itself, check his response to Self-Evaluation 7-1.

04
Core
26

Recognizes that elements in compounds are combined in definite numbers (ratios).

The student applies the concept that when elements combine to form a compound, they combine in definite numbers (ratios).

Student Action: Selecting only the sample whose subsamples have identical ratios and stating that when elements combine to form a compound, they combine in definite numbers (ratios).

- **A;** Beaker 3
- **B:** Beaker 2
- **C:** Beaker 1

Performance Check A: Bart has three beakers labeled 1, 2, and 3, each of which contains the elements zinc (Zn) and sulfur (S). He studied a sample from the top and the bottom of each of the beakers. His data are shown in the chart below.

BEAKER NUMBER	ATOMS OF Zn	ATOMS OF S
1 (top)	100	200
1 (bottom)	100	300
2 (top)	100	75
2 (bottom)	100	60
3 (top)	100	150
3 (bottom)	100	150

1. In which, if any, of the three beakers were zinc and sulfur present as a single compound?
2. How do you know?

Remediation: (1) Have the student check and explain his answer to Self-Evaluation 7-9. The explanation should include this concept. (2) Review pages 126 and 127, especially points 5 and 6 of the model on page 127.

04
Core

Calculates the number of atoms in a formula with a coefficient.

The student applies the rule that the number of atoms of an element (X) in a specified number of units of a formula ($4X_2Y$) is the product of the coefficient (4) of the formula and the subscript after the element (2).

27

Student Action: Responding with the product of the coefficient of the formula and the subscript after the element.

A: 1. 6, 2. 2
B: 1. 4, 2. 12
C: 1. 2, 2. 6

Performance Check A: Study the equation below.

$2AgNO_3$	$+ CuCl_2$	$\rightarrow Cu(NO_3)_2$	$+ 2AgCl$
(silver nitrate)	(copper chloride)	(copper nitrate)	(silver chloride)

1. How many atoms of oxygen (O) are present in the reactants?
2. How many chloride atoms (Cl) are present in the products?

Remediation: (1) Have the student go back to page 68 and look at the notation. Then help him apply this system of notation to chemicals. It may be that transferring this notational idea to chemical formulas simply did not occur to him. (2) It may be helpful for the student to substitute nuts and bolts for the components of the equation in the performance check and try out the reaction. (3) Ask him to explain his answers to questions 8-38 and 8-39.

O4 Core 28

Tells what happens to particles during a reaction.

The student applies the concept that in a chemical reaction the particles of the reactants recombine to form different substances (the products).

Student Action: Responding in effect that the particles of the reactants recombined into different substances (combinations).

Performance Check A: Jack made a blue solution containing a compound composed of particles A and B. He then made a colorless solution containing a compound composed of particles C and D. When he mixed the two solutions, a green solution and a white solid were formed. What happened to the particles during the reaction to cause these changes?

Remediation: (1) This idea is stated in the summary on page 127, but the evidence for it is developed throughout Chapters 7 and 8. (2) The interpretation of Table 8-4 is a good place to send the student for a review. A repeat of the activities leading up to Table 8-4 may be in order. (3) Excursion 8-2 makes the point that two new substances can be formed in a reaction.

O4 Core 29

Explains the relationship between the elements in the reactants and the products.

The student applies the rule that in ordinary chemical reactions, elements in the products are the same as those in the reactants.

Student Action: Responding to the effect that the stated reaction could not occur because the elements in the reactants and products are different.

Performance Check A:

1. Is it possible for the following reaction to occur?
2. Explain your answer.

$Pb(NO_3)_2$ + 2KI → $PbCl_2$ + $2NaNO_3$
(lead nitrate) (potassium iodide) (lead chloride) (sodium nitrate)

Remediation: This is a tough question. Information from several places has to be combined to arrive at this answer. (1) The student might feel that the substance was present as a reactant, but just overlooked. Explain that it is a ground rule that equations state all the reactants. (2) Give the student a short bolt with a hexagonal nut on it, and a long bolt and a square nut on it. Have him write the formulas for each nut and bolt reaction and then recombine them and write the formulas for the new combinations. Ask if the products look exactly like the reactants and whether any new nuts or bolts (atoms) were introduced to the differences. (3) Ask him to explain his answers to questions 8-38 and 8-39. (4) Ask why "copper atoms" would not have been a good response to Self-Evaluation 7-14.

04
Exc
7-1
1

Judges extrapolated values of various ranges beyond the range of the given data.

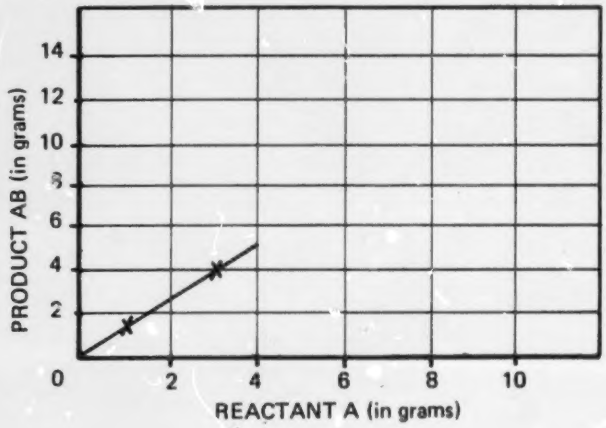
The student applies the concept that extrapolated values which are considerably beyond the ranges of plotted data are of questionable reliability because the relationship between the variables may change over the wide range.

Student Action: Indicating the extrapolated value farther from the plotted data to be weaker because the chance that the relationship could change is greater and stating the effect of the concept in explanation.

A: Where A = 10 grams
B: Where R = 14 grams
C: Where A = 13 grams

Performance Check A: Suppose that you were given the graph below and asked to predict the amount of product AB formed when 5 g and 10 g of reactant A reacted with a set amount of B.

1. Which, if either, of the two predicted values would you be less sure of?
2. Why?



Remediation: This concept was well expressed in the last paragraph on page 433 where an extrapolation of Alice's growth would make her 260 cm tall at age 28.

04
Exc
7-1
2

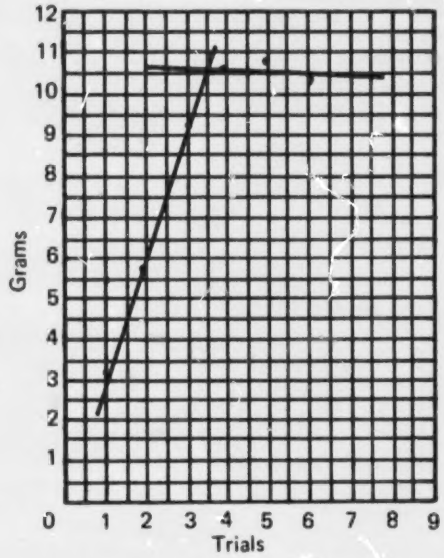
Plots data and draws best-fit lines.

The student applies the process of plotting the data on a grid and drawing the best-fit lines.

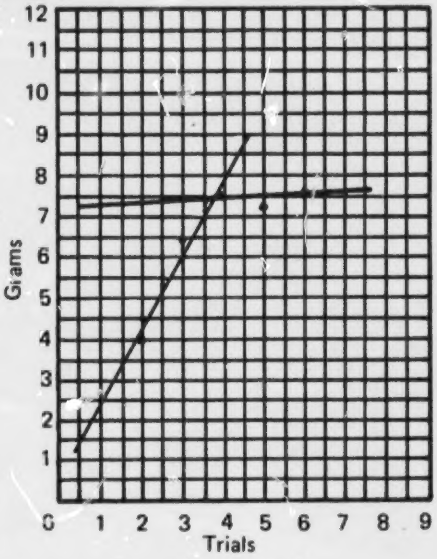
Special Preparations: Have graph paper ready or, still better, have duplicated labeled grids prepared for the students.

Student Action: Plotting the points and drawing the lines in such a way that the graph shows the intersection of the two straight lines.

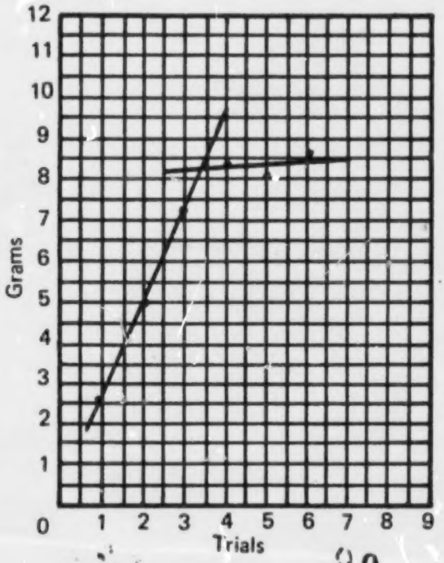
A:



B:

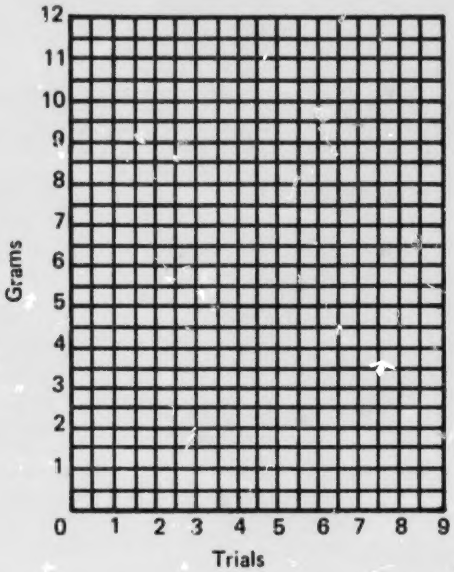


C:



Performance Check A: Get a piece of graph paper, label it like the grid below, and plot the data. Draw in the best-fit lines for the data.

TRIAL	g OF $CaCl_3$
1	3.2
2	5.8
3	9.3
4	10.6
5	10.8
6	10.5



Remediation: There are two probable difficulties for a student in responding to this check. (1) The student may not understand how to estimate and plot fractions of numbers. (2) Drawing a best-fit line may be a problem.

Using larger graph paper with more lines may help solve the first problem. The idea of best fit was covered in Excursions 5 and 18 of the Level I text. If you can get a copy of the Level I text, Excursions 4, 5, and 18 are good for teaching the idea of graphing and Excursion 6 is of value in teaching how to estimate points between whole numbers.

Selects graphs which show two variables increasing together.

O4
Exc
7-1
3

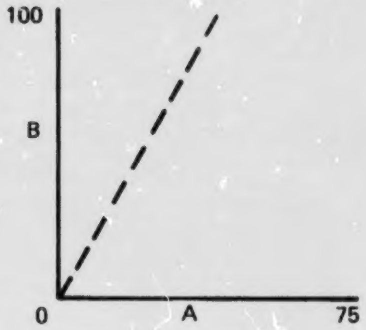
The student classifies graphs whose lines rise from left to right as graphs showing the relationship between two variables that vary with one another.

Student Action: Selecting the graphs whose lines rise from left to right.

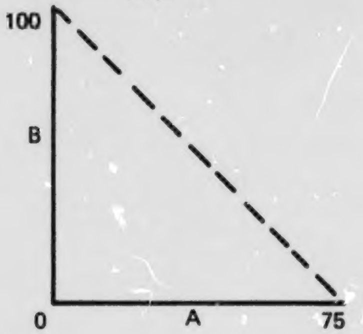
A: a and f
B: a and c
C: c and e

Performance Check A: List the letters of any graphs which tell you that when A increases, B also increases.

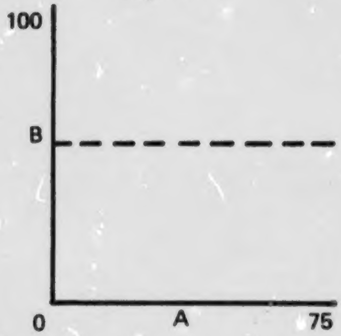
Graph a



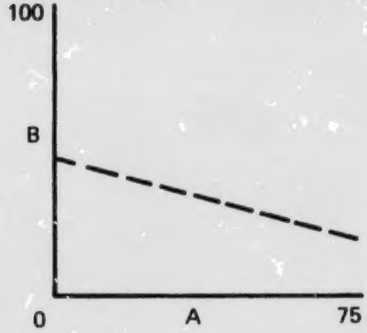
Graph b



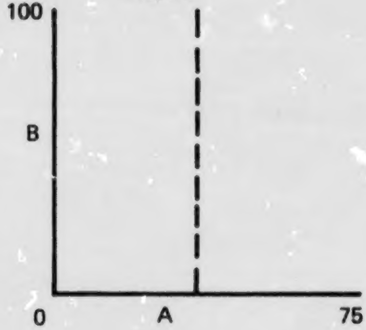
Graph c

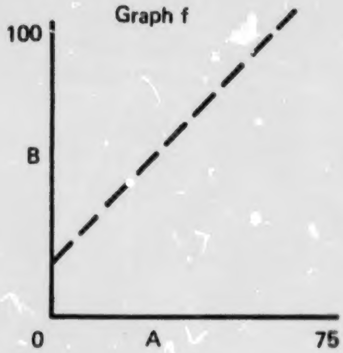


Graph d



Graph e




Graph f

Remediation: (1) One way to handle this problem is to refer the student to Figure 2 on page 429 and to label the X axis "A" and the Y axis "B." Ask such questions as when John Smith was 120 cm tall, was he older than when he was 100 cm tall, or whether B increases when H increases. (2) Once it looks like the student has the hang of this idea, give him an alternate form of the check.

04
Exc
7-1
4

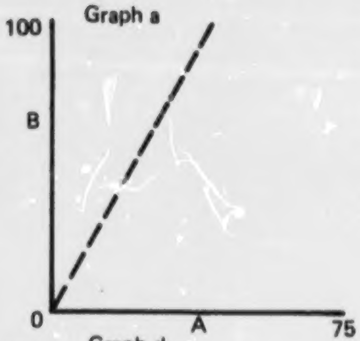
Selects graphs showing only one variable remaining constant.

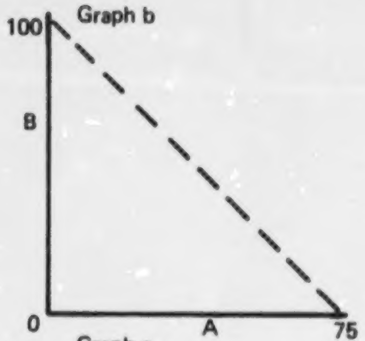
The student classifies graphs with a straight line parallel to one of the axes as graphs in which one variable remains constant while the other varies.

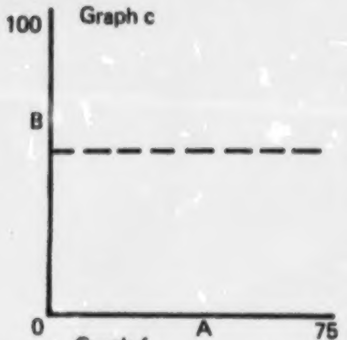
Student Action: Selecting the graphs with lines parallel to one of the axes.

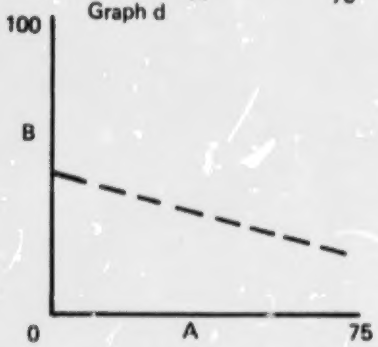
A: c and e
B: b and d
C: e and f

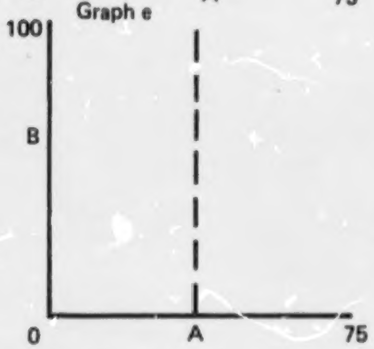
Performance Check A: List the letters of any graphs which show one variable which stays the same while the other increases.

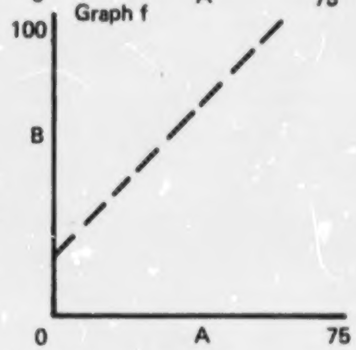












Remediation: (1) Have the student examine Figure 2 on page 429 and ask if John Smith's height stayed the same between his twentieth and twenty-second birthdays. If he answers yes, ask how he knows. The fact that the line is nearly flat should make relating the graph in Figure 2 to the choice of the horizontal line graph in the performance check rather easy. (2) Relating it to the vertical line graph in the check may be more difficult. To help the student see this, refer him to graph e in Performance Check A above and ask him to state what happens to A when B increases from 0 to 50 and from 50 to 100. He should see that such a graph means that one variable (B) increases, but there is no change in the other variable (A).

Extrapolates and interpolates from a graph.

04
Exc
7-1
5

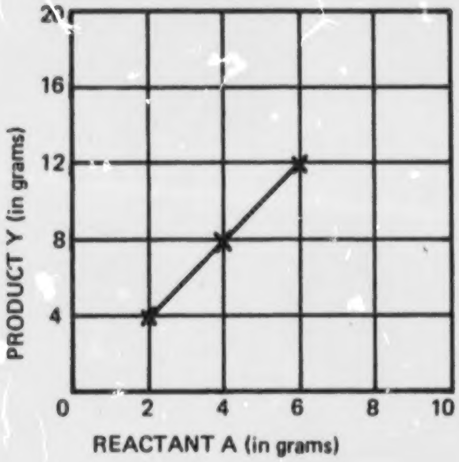
The student applies the procedures involved in extrapolating and interpolating from a graph.

Student Action: Reporting the value ordinates to within ±1 g.

A: 1. 6 g, 2. 10 g, 3. 14 g, 4. 2 g
B: 1. 2 g, 2. 6 g, 3. 16 g, 4. 10 g
C: 1. 10 g, 2. 6 g, 3. 20 g, 4. 2 g

Performance Check A: From the graph, predict how many g of product Y would be formed if

1. 3 g of reactant A were used.
2. 5 g of reactant A were used.
3. 7 g of reactant A were used.
4. 1 g of reactant A were used.



Remediation: (1) Extrapolation is involved in the interpretation of Figure 5, page 433, as directed by question 10-14. The risks of extrapolation are discussed in the excursion and a student might miss this check because he feels that he should not go beyond the data. If that is the case, point out that extrapolation can be useful in making predictions. (2) If the problem lies with the mechanics of extrapolating, review the process of extending the line and reading the desired value on that line.

04
Exc
7-2
1

Lists solutions in order of concentration.

The student classifies solutions according to their concentration (the amount of solute per unit of solvent).

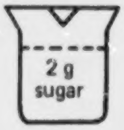
Student Action: Ordering the samples so that the number of grams of solute increases and indicating the more concentrated of a given two of the solutions.

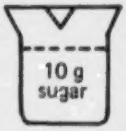
A: 1. a, e, c, d, b
2. b

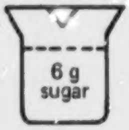
B: 1. a, e, c, d, b
2. d

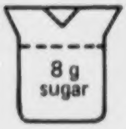
C: 1. a, e, c, d, b
2. c

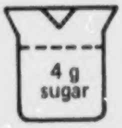
Performance Check A: Jack put 100 ml of water into each of the five beakers shown below. Then in each beaker, he dissolved the different amounts of sugar shown.

a.


b.


c.


d.


e.


1. Starting with the least concentrated solution, list the letters of the beakers of solutions in order of concentration.
2. Which is the more concentrated solution, b or d?

Remediation: (1) Check to see if the student knows what is meant by *concentration.* The definition is on page 436 in the next to last paragraph. (2) If he does, have him review questions 3 and 5, page 437.

Calculates the concentration of a solution in grams per milliliter.

04
Exc
7-2
2

The student applies the rule for finding concentrations as dividing the weight of the solute by the volume of the solution.

Student Action: Stating the concentration in g/ml.

- **A:** 0.018 g/ml
- **B:** 0.6 g/ml
- **C:** 0.6 g/ml

Performance Check A: A glass of ice tea contains 100 ml of water and tea and 1.8 g of sugar. What is the concentration of the sugar in the solution? State your answer in grams per milliliter (g/ml).

Remediation: (1) Refer the student to the two conclusions given under question 12, page 439. (2) If this is unclear to him, have him repeat or review the first four activities and the associated questions.

Calculates the weight of a solute in a sample of a solution.

04
Exc
7-2
3

The student applies the formula:

$$\frac{\text{g of solute in X}}{\text{volume of solution}} = \frac{\text{X volume of solution}}{\text{total volume of solution}} \times \begin{matrix}\text{g of solute}\\ \text{in total solution}\end{matrix}$$

Student Action: Reporting the number of grams of solute as determined by substituting the values of the problem in the above equation.

- **A:** 10 grams
- **B:** 20 grams
- **C:** 40 grams

Performance Check A: Jim had a 500 ml bottle of maple syrup. The 500 ml of syrup contained 100 g of dissolved maple sugar. Jim poured 50 ml of the syrup on his pancakes. How many grams of maple sugar did he put on his pancakes?

Remediation: (1) Have the student redo or review Activities 3 and 4 and questions 8 through 12 of Excursion 7-2.

Handles a thermometer, using the accepted procedure.

04
Exc

The student manipulates the thermometer using the accepted procedure of (1) placing the thermometer into the water but not touching the bottom of the beaker, (2) waiting for the fluid in the thermometer to adjust, (3) aligning his eye with the fluid level in the thermometer when taking a reading, and (4) reading the temperature with the bulb of the thermometer submerged.

8-1
1

Regular Supplies: 1 Celsius thermometer
1 250-ml beaker
water

Student Action: Performing the four specified operations and reporting the temperature to within 1°C of the value read by an observer.

Performance Check A: Get the following equipment.
1 250-ml beaker
1 Celsius thermometer
water

Get your teacher or an appointed observer to watch you. Measure and record the temperature of the water.

Remediation: The student who misses this should review Excursion 8-1.

O4
Exc
8-2
1

Names a method for recovering an unseen product.

The student applies the concept that unseen products are often dissolved in a solution and are recoverable by evaporating the solvent.

Student Action: Naming the solution as containing the other product and evaporation of the solvent as the way to get the product.

Performance Check A: Willie performed the following reaction by mixing two solutions:

lead nitrate + calcium chloride → lead chloride
(solution) (solution) (solid)

Lead chloride is a white solid which forms and settles to the bottom of the liquid. Willie said there should be another product, calcium nitrate.

1. If Willie is right, where is that product?
2. How could you get it?

Remediation: Point out to the student that a procedure for finding a dissolved product is given in Activities 2 and 3 of this excursion.

O4
Exc
8-3

Recognizes the product of a reaction involving an atom team.

The student classifies the formula which contains the atom team intact as the only possible product of the reaction.

Student Action: Selecting the formula containing the atom team intact.
A: d
B: e
C: a

1

Performance Check A: Ammonium (NH_4) is an atom team. If ammonium hydroxide (NH_4OH) reacts with zinc chloride ($ZnCl_2$), which of the following would be a product of the reaction?

a. NH_3Cl
b. NH_2Cl
c. NCl
d. NH_4Cl
e. $NHCl$

Remediation: Review page 451, especially question 11.

Chapters 9 and 10 Performance Check

Excursions 9-1 thru 10-2 Summary Table

Objective Number	Objective Description
05-Core-1	States the purpose of a control in an experiment
05-Core-2	Names a sample not treated by the experimental variable
05-Core-3	States how reversing battery connections affects ion flow
05-Core-4	Explains the lack of movement of ions toward electrodes in a solution
05-Core-5	Recognizes a reason that rubbed objects attract each other
05-Core-6	Names the particles in a solution which allow the flow of electricity
05-Core-7	Names the two types of electrical charge
05-Core-8	States the reaction of like and opposite charges to each other
05-Core-9	States the rule which explains the charges on repelling objects
05-Core-10	Names the charge on an object attracted by another object whose charge is known
05-Core-11	Outlines a procedure to test the relationship of charges on two objects
05-Core-12	States the rule of the attraction or repulsion of charged objects
05-Core-13	States and performs a test for the presence of the sulfate ion
05-Core-14	States the importance of operational definitions
05-Core-15	Indicates the meaning of different symbols in a chemical formula
05-Core-16	Names the force holding matter together
05-Core-17	Predicts ion combinations
05-Core-18	States why ions attract each other

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				applies	
				Q		√				classifies	
										applies	
						√				applies	
				Q					√	applies	
						√				applies	
				Q		√				recalls	
				Q		√				recalls	
						√				applies	
				Q		√				applies	
						√				applies	
						√				applies	
	M	O	P	Q	T					applies	
						√				applies	
				Q		√				applies	
				Q		√				applies	
				Q					√	applies	
									√	applies	

Objective Number	Objective Description
05-Core-19	States the charge on the second particle in a two-particle compound
05-Core-20	Selects a reason for labeling materials and recording data
05-Core-21	States whether scientists consider models to be tentative or definite
05-Core-22	Recognizes the basis on which scientists accept statements
05-Core-23	States whether or not ions are models
05-Exc 9-1-1	Names the charge on a particle attracted to a rod of specified charge
05-Exc 10-1-1	States how the rate of evaporation affects crystal size
05-Exc 10-2-1	Explains the mass change of submerged metal strips as a current flows through a solution
01-Core-24 thru 28R	(Student's responsibilities)
02-Core-3R	Decides whether a single test provides definite evidence
02-Core-6R	Selects examples of operational definitions
02-Core-16R	States why controls are used in experiments
03-Core-22R	States whether atoms are created or destroyed in forming solutions

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
									√	applies	
				Q						classifies	
				Q		√				applies	
				Q		√				applies	
				Q					√	applies	
				Q						applies	
										applies	
										applies	
		O				√				chooses	
						√				applies	
				Q		√				classifies	
						√				recalls	
						√				applies	

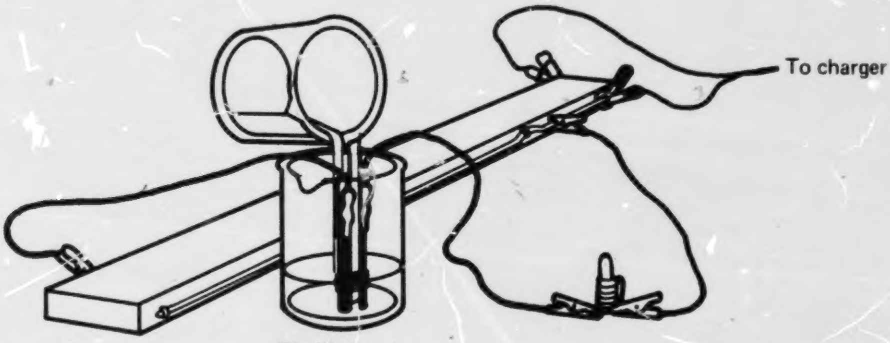
05 Core 1

States the purpose of a control in an experiment.

The student applies the concept that a control is used to determine if it is the variable being investigated, rather than some other variable, which is most related to the results observed.

Student Action: Responding that it is necessary to use the distilled water first and then the copper sulfate ($CuSO_4$) solution to show that it is the $CuSO_4$, not the water in the solution, that conducts electricity.

Performance Check A: You did the activity diagramed below to find out if copper sulfate ($CuSO_4$) in solution would conduct electricity. First you did the activity, using distilled water. Then you were asked to put $CuSO_4$ into the water. Why couldn't you have skipped the step using only distilled water and put a $CuSO_4$ solution into the beaker in the first place?



Remediation: (1) The student who missed this check may have had trouble with the same idea in Chapter 4, page 47. Have him repeat the Checkup. If necessary, suggest that he do or repeat Excursion 4-1. (2) A student may suggest that the reason for placing the electrodes into the water is to remove impurities, which would be a good procedure. If so, ask him the question again, telling him that the electrodes are clean. (3) Review Self-Evaluation 6-12 and its answer as a situation analogous to the one presented in this question.

05 Core

Names a sample not treated by the experimental variable.

The student classifies as a control a sample which is treated in the same way as the experimental sample except for the variable being tested.

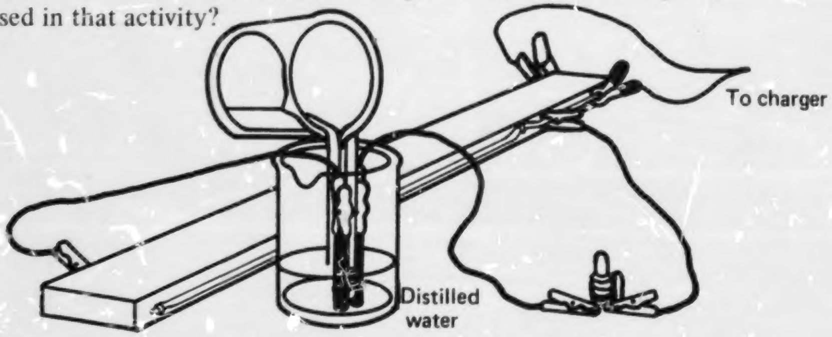
Student Action: Selecting the term *control.*

A: d
B: a
C: c

2

Performance Check A: In an activity, you were asked to find out if copper sulfate ($CuSO_4$) in a solution would conduct electricity. First you tested pure distilled water, as shown below. Then you were asked to test a solution of $CuSO_4$ and water. Which term below is used to describe something that is used in the way the distilled water was used in that activity?

a. Reactant
b. Product
c. Element
d. Control



Remediation: (1) This situation is slightly different from the examples of controls presented before. In the previous cases, the controls were run in parallel with the experimental variable. Here the control comes before the experimental variable is manipulated. If that is not the difficulty, refer the student to the examples on page 47 and to Excursion 4-1. (2) Review page 80 and the student's response to Self-Evaluation 6-12. Ask him whether heating the plain charcoal would still have been a control situation if it had been done prior to heating the charcoal and yellow powder.

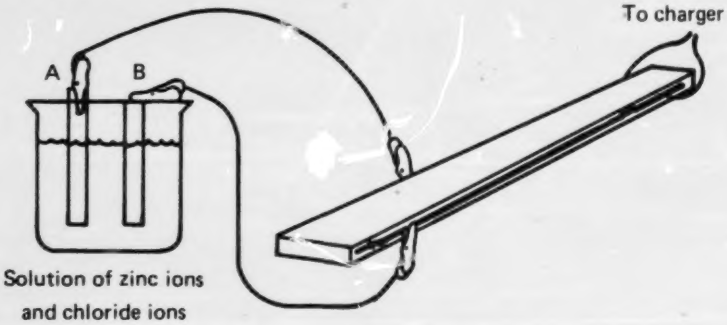
05
Core
3

States how reversing battery connections affects ion flow.

The student applies the concept that ions of a given charge move toward an electrode which is oppositely charged.

Student Action: Responding that reversing the charges of the rods (electrodes) in an ionic solution reverses the direction of ion flow.

Performance Check A: Jerry hooked up his apparatus as shown below. Rod A was positive and attracted chloride ions. Rod B was negative and attracted zinc ions. Jerry was called out of the room, so he disconnected the rods. When he reconnected the rods, he mixed up the leads, and B became positive and A negative. How would this affect the ion flow in the solution?



Remediation: (1) If the student missed this check, it could be a clue that he is not doing the activities. This check follows exactly the procedure of Activity 9-5. (2) It may be that the student does not understand that the charger causes electricity to flow in one direction or the other but not both at the same time. The flow of electricity through this circuit should be explained to him.

O5 Core 4

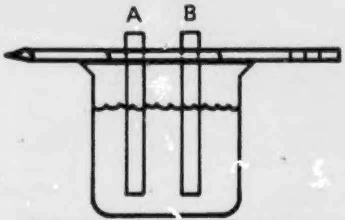
Explains the lack of movement of ions toward electrodes in a solution.

The student applies the concept that ions in a solution move towards an electrode if, and only if, the rod is charged (is part of an electrical circuit).

Student Action: Responding negatively and that there would be no motion because the electrodes were uncharged (not connected).

Performance Check A: Bill put two carbon rods into a copper sulfate ($CuSO_4$) solution, exactly as shown below. He wanted the copper (Cu) ions to move to carbon rod A. He left the equipment in place overnight so that the copper ions would have time to move.

1. When Bill comes to school in the morning, will the copper ions have moved to carbon rod A?
2. Explain your answer.



Solution of positive Cu ions
and negative SO_4 ions

Remediation: (1) This is an application of the idea developed in Activities 9-9, 9-10, and 9-11. When the carbon rod was not connected to the circuit, no copper was deposited on it. (2) Ask the student to review these activities and answer question 9-18. (3) Check Self-Evaluation 9-4 and the response.

O5 Core 5

Recognizes a reason that rubbed objects attract each other.

The student applies the principle that some objects can be given opposite charges by rubbing them together.

Student Action: Selecting the statement to the effect that opposite charges are produced by rubbing the objects together.

A: c
B: a
C: b

Performance Check A: Select the phrase which best completes the following story. A Kleenex tissue is not attracted to a plastic comb. They are rubbed together. After the rubbing, the tissue is attracted to the comb. The rubbing

a. produced the same charge on both objects.
b. removed the charges so they would attract each other.
c. caused the objects to be oppositely charged.
d. either a or b.

Remediation: (1) This is a tricky check, as this concept is not flatly stated in the text so far. Ask the student why the woolen cloth or the tissue paper used in Activities 9-17 and 9-18 are to be placed some distance away from the strips. Suggest that he try it. (2) The adept student should be able to get this idea if he thinks about it. Where did the rubbed off charges go? (3) A similar activity is described later on pages 167 and 168 and shown in Figure 11-4, so don't unnecessarily waste time on remediation at this point.

---

05 Core 6

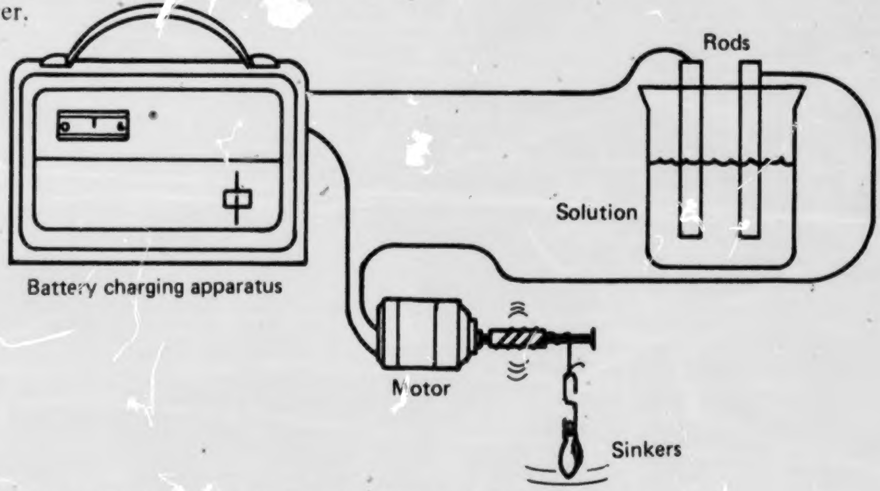
Names the particles in a solution which allow the flow of electricity.

The student applies the concept that electricity will flow through a solution only if ions are present in the solution.

Student Action: Responding that ions are present in the solution because electricity is flowing and with the notion of the concept.

Performance Check A: In the diagram, the equipment is operating properly. The motor lifts the sinkers.

1. What kind of particles does this tell you are in the solution?
2. Explain your answer.



Remediation: (1) Review the similar situation in Activities 9-3 through 9-5, in which a light bulb is used in place of the motor. (2) Ask the student to explain in terms of particles why the copper sulfate solution would conduct electricity, whereas the water did not. (3) Review page 137. (4) Review Self-Evaluation 10-6.

05 Core 7

Names the two types of electrical charge.

The student recalls positive and negative as the two types of electrical charges.

Student Action: Stating the terms *positive* and *negative.*

Performance Check A: There are two types of electrical charge. What are they?

Remediation: This is stated in the paragraph above Figure 9-1 on page 142 and in the summary on page 143.

05 Core 8

States the reaction of like and opposite charges to each other.

The student recalls the rule that oppositely charged objects attract and objects with like charges repel each other.

Student Action: Responding that oppositely charged objects attract and objects with like charges repel each other.

Performance Check A: State the rule which tells what would occur when objects with like charges or objects with opposite charges are brought near each other.

Remediation: (1) This statement occurs in the paragraph below Figure 9-1 on page 142, but the recall should also come from the activities with the vinyl and acetate strips. (2) See Self-Evaluations 10-3 and 10-4, which involve applications of this principle.

05 Core 9

States the rule which explains the charges on repelling objects.

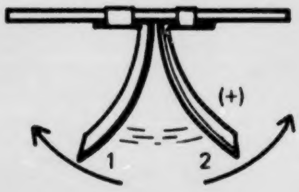
The student applies the principle that objects with like charges repel.

Student Action: Naming the charge on the object and stating the notion of the rule that objects with like charges repel each other.

A: Positive (+)
B: Positive (+)
C: Negative (-)

Performance Check A: The strips of aluminum foil in the diagram below are repelling each other. Foil strip 2 has a positive charge.

1. What is the charge on foil strip 1?
2. On what rule did you base your answer?



Remediation: (1) This rule is stated in the paragraph below Figure 9-1 on page 142 and helps to explain some of the movements of the acetate and vinyl strips. (2) Have the student repeat or review Activities 9-12 through 9-17 and then read the performance check to him substituting vinyl or acetate strips for objects 1 and 2.

---

05 Core 10

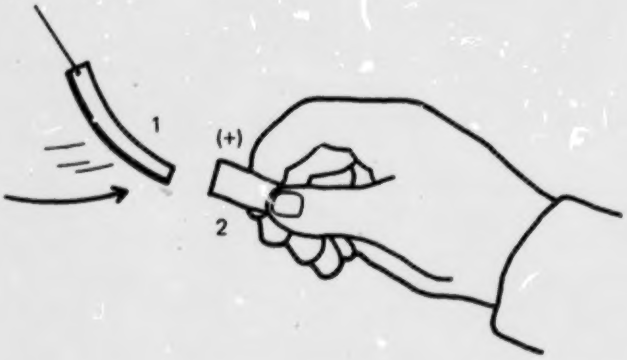
Names the charge on an object attracted by another object whose charge is known.

The student applies the rule that two oppositely charged objects attract each other.

Student Action: Naming the unknown charge as opposite to the known charge.

- **A:** Negative (-)
- **B:** Negative (-)
- **C:** Positive (+)

Performance Check A: Rectangles 1 and 2 in the diagram are strips of aluminum foil which attract each other. Strip 2 has a positive charge. What is the charge on strip 1?



Remediation: (1) This is an application of the statement in the paragraph below Figure 9-1 on page 142. The student should be able to take the information given on page 142 and apply it to this activity. (2) Activities 9-12 through 9-17 have several examples of unlike charges attracting each other. (3) Have the student answer question 9-27 in terms of positive and negative charges.

---

05 Core 11

Outlines a procedure to test the relationship of charges on two objects.

The student applies the rule that unlike charges attract each other and like charges repel each other.

Student Action: Responding that to determine whether the charge on two objects is the same or different, either the two objects should be put near each other to see if they attract or repel, or the two objects should be brought near a single charged object to see if they react the same or differently.

Performance Check A: A red and a blue balloon are each given a charge. How could you find out if they have the same or different kinds of charges?

Remediation: (1) Ask the student if the charges on the vinyl strips in Activities 9-16 and 9-17 are alike. If the answer is yes, question what happened. (2) Then transfer this information to the performance check.

05 Core 12

States the rule of the attraction or repulsion of charged objects.

The student applies the concept that opposite charges attract.

Student Action: Stating that the ions will move toward the electrode of opposite charge because opposite charges attract.

A: Toward
B: Away from
C: Toward

Performance Check A: Sue made a solution which contained positive iron ions.

1. If she put a positively charged rod and a negatively charged rod into the solution, would the iron ions move toward or away from the negatively charged rod?
2. Why?

Remediation: (1) The concept is stated in clues 2 and 5 on page 143. Applying the concept, however, is a different mental operation from recalling it. (2) A similar operation was done in Activity 9-5, and a similar situation is described graphically in Figure 10-5.

05 Core 13

States and performs a test for the presence of the sulfate ion.

The student applies the rule that the presence of the sulfate ion (SO_4) is shown by a cloudy white solid which forms when barium chloride ($BaCl_2$) is added to a solution in which it is present.

Regular Supplies:

sodium sulfate (Na_2SO_4) solution (1M)
6 bottles
3 test tubes

Special Preparations: Put a solution of 1M sodium sulfate (Na_2SO_4) in bottles1 and 4. Fill bottles 2, 3, 5, and 6 with water. Put all the bottles in a box labeled 05-Core-13.

Student Action: Adding barium chloride ($BaCl_2$) solution to the solutions and reporting the presence of the sulfate ion in those solutions in which a white solid forms.

A: Bottle 1
B: Bottle 4
C: Bottle 4

Performance Check A: Get bottles 1, 2, and 3 from box 05-Core-13. Also get three test tubes. In separate test tubes, put about 3 ml of each solution. Decide what you need to do to find out if the sulfate ion is present in any of these solutions. Check your plan with your teacher. If it is all right to go on, get what you need and test the solutions. Record the bottle number of any solution which contains sulfate ions.

Remediation: (1) The paragraph above question 10-11 on page 149 is a good reference for the student. (2) Have the student check the operational definition for *sulfate* that he wrote in question 10-11. (3) Review his response to Self-Evaluation 10-1.

05
Core
14

States the importance of operational definitions.

The student applies the concept that an operational definition states the way in which we can determine the presence or absence of a substance.

Student Action: Responding to the effect of the concept above.

Performance Check A: You operationally defined the sulfate ion. What do such operational definitions of substances tell you?

Remediation: (1) Refer the student to page 31 where operational definitions as used in a chemical context are discussed thoroughly. (2) The student may include in his answer that an operational definition of a substance involves the notion of, "How much," as well as the notion of detection. If so, accept his response, but have him review pages 31 and 149.

05
Core
15

Indicates the meaning of different symbols in a chemical formula.

The student applies the convention that each different symbol in a formula indicates a different element.

Student Action: Responding negatively and stating the number of elements indicated by the formula.

A: 1. No, 2. 2
B: 1. No, 2. 2
C: 1. No, 2. 2

Performance Check A: You have worked with negatively charged sulfate (SO_4) ions.

1. Is the SO_4 ion composed of just one element?
2. If so, what is it? If not, how many elements are there in the ion?

Remediation: (1) Have the student review Table 5-1 on page 60 and question 5-1. (2) If the student responds with more than two elements, he may be counting the number of atoms represented by the formula, which is four in B and C and 5 in A. (3) You may illustrate the idea, using a long bolt (sulfur) and four nuts (oxygen).

05 Core 16

Names the force holding matter together.

The student applies the concept that matter is held together by electrical force.

Student Action: Stating that the atoms in the given compounds are held together by electrical force (attraction).

Performance Check A: Salt ($NaCl$) and potassium iodide (KI) are compounds. According to the model you are developing, what force holds the atoms in each of these compounds together?

Remediation: (1) This is stated in the paragraph below Figure 10-5 on page 155. It is the major concept being developed throughout Chapters 9 and 10. (2) The critical activities are 10-5 through 10-9 and the associated questions. (3) Have the student read pages 154 and 155. If absolutely necessary, have him review or even repeat Activities 10-5 through 10-9. (4) See Self-Evaluation 10-5.

05 Core 17

Predicts ion combinations.

The student applies the concept that opposite charges attract and like charges repel.

Student Action: Predicting combinations of only positive and negative ions. The order of the ions in a combination is irrelevant here. The + and - signs may or may not be shown.

Possibilities (only three are necessary for an answer)

A: $NaCl$, $NaBr$, $NaNO_3$, $AgCl$, $AgNO_3$, $AgBr$, KNO_3, KBr, KCl
B: $LiCl$, $LiBr$, $LiNO_3$, $NaCl$, $NaBr$, $NaNO_3$, HCl, HBr, HNO_3
C: $NaBr$, $NaCl$, NaF, $AgBr$, $AgCl$, AgF, $LiBr$, $LiCl$, LiF

Performance Check A: Kevin found that the ions below had the charges shown. The plus sign represents a positive charge, the minus sign a negative charge.

Ag^+, Cl^-, Br^-, Na^+, K^+, NO_3^-

Based on your experience, predict three pairs of two ions each that could combine to form compounds.

Remediation: (1) Some students may already be able to make this application, but the question is going beyond the data. The notion that particles with unlike charges are held together is summarized on page 154 and predictions of recombination can be inferred from this. (2) If a student has not grasped this idea, it is very likely that he will understand it after doing the activities of Chapter 10 which suggest a model for recombinations. (3) Another source of difficulty may be a failure to understand the words *ion* and *compound*. (4) Review his answers to Self-Evaluations 9-3 and 10-8.

05
Core
18

States why ions attract each other.

The student applies the concept that only unlike charges attract.

Student Action: Selecting only those ion pairs with unlike charges and stating that only unlike charges attract.

A: c, d
B: a, d
C: a, b

Performance Check A:

1. Select any pair or pairs of ions below in which the paired ions will attract each other.
   - a. Cu^+, Na^+
   - b. Cl^-, NO_3^-
   - c. Na^+, NO_3^-
   - d. Cl^-, Cu^+
2. State why you chose as you did.

KEY	
+	Positive ion
-	Negative ion

Remediation: (1) This idea is an extension of the idea that unlike charges attract, presented on page 154. (2) The student's problem may just be that the concept is being applied to a new situation. In these checks the oppositely charged objects are not particles and rods, as in the text so far, but are two particles. If the student is not able to make this transfer, have him move into Chapter 11, where this idea is developed further.

05
Core
19

States the charge on the second particle in a two-particle compound.

The student applies the concept that oppositely charged particles of matter attract each other.

Student Action: Naming the charge opposite to the charge stated for the other ion in the compound and stating the fact that oppositely charged particles of matter attract each other.

Performance Check A: Gary did some activities with a solid, yellow compound. He found that it contained calcium ions, which have a positive charge. He found that the only other thing the compound contained was chromate particles.

1. Name the kind of charge on the chromate particles.
2. Explain why you predicted the charge you did.

Remediation: (1) Don't remediate at this time. Have the student begin Chapter 11, where this idea is expanded. (2) Reevaluate this objective after the next unit.

05

Selects a reason for labeling materials and recording data.

The student classifies labeling materials and recording observations as helpful investigative procedures.

Core 20

Student Action: Selecting the entry which states that these practices are helpful procedures of investigation.

- **A:** b
- **B:** c
- **C:** d

Performance Check A: In this course you have been asked many times to label test tubes, vials, beakers, and other materials. You have also been told to write down your observations immediately. The major reason for doing these things is that

a. students tend to forget.
b. it's helpful procedure when investigating.
c. then you cannot make any mistakes.
d. this is science. An historian would not be so careful.

Remediation: (1) This idea is not expressly stated but is implied throughout the course. (2) Ask the student to get three vinyl strips, and call them A, B, and C. Shuffle them rapidly. Ask him which is strip A. Could a scientist identify strip A any better than he? (3) Ask him to tell you how many milliliters of solid formed when he mixed 5 milliliters of K Special and 5 ml Pb Special? Tell him to check page 95, Table 7-5. (4) If the student selected the option involving the historian, discuss the need of researchers in all disciplines to keep good notes to keep track of who did what, where, and when.

05

Core 21

States whether scientists consider models to be tentative or definite.

The student applies the concept that scientists consider their models and the explanations based on them to be tentative.

Student Action: Selecting the statement about the quotation which is written in tentative terms and which includes the notion that scientists consider models and their implications to be tentative.

- **A:** a
- **B:** c
- **C:** d

Performance Check A: Textbooks 1 and 2 both explain what happens when electricity is passed through a copper sulfate solution.

Book 1 says:

> A particle model for matter assumes that ions of copper are very tiny. Therefore, these matter particles could move about, and you wouldn't see them. This model is useful and may be applied to other substances as long as it is supported by your observations. To apply it to other substances, you will need more data.

Book 2 says:

> The tiny copper and sulfate ions move toward the charged rods. The movement of the copper and sulfate ions proves that differently charged ions exist in all matter and do move in solutions.

Select the answer below which correctly tells both which book a scientist would probably prefer and why he would prefer it.

a. Book 1, because it says that experimental results support models, but experimenting must continue.
b. Book 2, because it states facts that you proved in class.
c. Book 2, because it states more facts than Book 1.
d. Book 1, because it uses the word *model.*
e. Either book, because they both talk about the same thing.

Remediation: (1) You may have to tell students many times during the course of the year that scientists rarely prove anything. Instead they support ideas. (2) Excursion 1-1 is a good review if you remind the student that an ion is an idea or a model for the particles in solution.

05 Core 22

Recognizes the basis on which scientists accept statements.

The student applies the concept that scientists accept statements when they are based on valid experimental evidence.

Student Action: Selecting the statement involving an experiment with a control sample.

A: d
B: c
C: b

Performance Check A: Assume that Dr. Lillian Braithwaite is a great scientist who is respected and listened to by other scientists. She says that virus X causes brain damage in mice. Other scientists would accept the statement if Dr. Braithwaite

a. put a statement about this into a textbook she is writing.
b. got three other great scientists to say that they believe she is correct.
c. produced a pure strain of virus X.
d. reported her experiments involving both some mice infected with virus X and some which were not.

Remediation: These ideas of how a scientist works are evident throughout the core of the program but are concentrated in Excursion 4-1. Have the student who missed this check review Excursion 4-1.

05 Core 23

States whether or not ions are models.

The student applies the concepts that ions are models and that models are useful ways to explain observations, rather than that they are known to be correct.

Student Action: Selecting the entry implying that ions are models useful for explaining the behavior of some matter paritcles.

A: d
B: b
C: a

Performance Check A: In Chapter 10, you studied the behavior of some matter particles in solutions. The text discussed a kind of matter particle called an *ion.* Which of the following statements best describes ions?

- a. Scientists have seen ions in solutions.
- b. All matter is made up of ions.
- c. Only the ion model can explain the observations you made.
- d. The idea of an ion was thought up by scientists to explain the behavior of some matter particles.

Remediaton: Refer the student to Excursion 1-1.

05
Exc
9-1
1

Names the charge on a particle attracted to a rod of specified charge.

The student applies the concept that oppositely charged objects attract each other.

Student Action: Responding that the charge on the ion is opposite that of the rod toward which it migrates.

- **A:** Negative
- **B:** Positive
- **C:** Negative

Performance Check A: Suppose you fell into a solution and shrank. If you shrank to the size of matter particles, you could ride Iggy's Ion Express. If you want to ride to the town of Positive Rod, what would you be charged?

Remediation: (1) Refer the student back to pages 142 and 143, where the basic ideas are presented. (2) The notion of an "Ion Express" is introduced in Excursion 9-1.

05
Exc
10-1
1

States how the rate of evaporation affects crystal size.

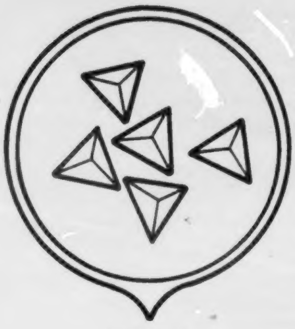
The student applies the concept that the rate of crystallization affects crystal size inversely.

Student Action: Naming the beaker with the smaller crystals and stating that rapid evaporation produces smaller crystals than slower evaportation.

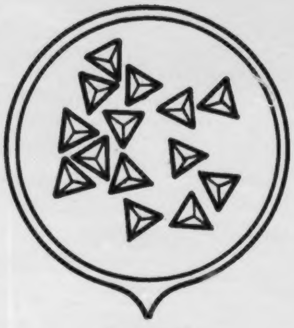
- **A:** Beaker B
- **B:** Beaker 2
- **C:** Beaker B

Performance Check A: Bill left beakers A and B of the same solution sitting in different places in Mr. Taylor's room. Later, Jane found the beakers. The solutions had evaporated, leaving crystals which looked like those in the diagrams below.

1. Which of the solutions had evaporated faster?
2. Explain your answer.



Beaker A
Blue crystals



Beaker B
Blue crystals

Remediation: (1) This is an application of an interpretation of the data as recorded in the blue chart under question 12 on page 465. (2) A quick review of these ideas is given on page 466.

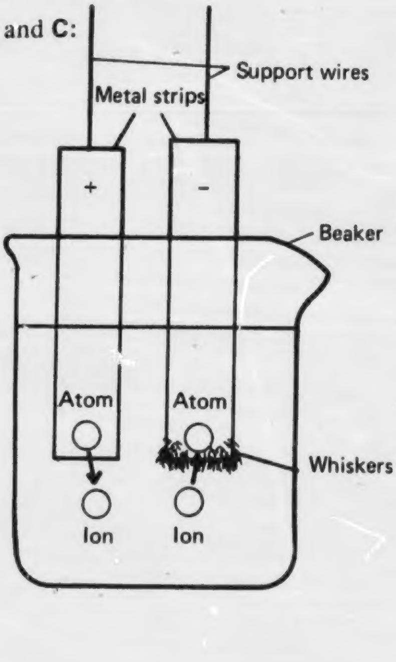
Explains the mass change of submerged metal strips as a current flows through a solution.

05
Exc
10-2
1

The student applies the concept that particles move from one electrode to another as electricity flows through the conducting solution.

Student Action: Stating and diagraming the essence of the following two statements: (1) some of the atoms (or ions) of metal in the positive strip separated and disappeared into the solution and (2) these ions (and perhaps some of the ions already in the solution) moved to the negative strip and collected there, forming whiskers.

Sample diagram for **A, B,** and **C:**



Performance Check A: Open your textbook to Table 1 on page 472.

Steve filled in the table with the following data, working with a setup like the one shown on page 473, but using silver metal strips and silver nitrate solution.

	NEGATIVE STRIP	POSITIVE STRIP
Initial pointer position	5.3 cm	5.3 cm
Final pointer position	6.7 cm	4.1 cm
Change in position	down 1.4 cm	up 0.8 cm
Observations	silver crystals forming	

On your answer sheet, tell how you explain the data above. Use a labeled diagram to illustrate your answer.

Remediation: (1) Check the student's answer to question 11 on page 475. (2) If his answer to question 11 is poor, review with him questions 1 through 9, pages 473 through 475.

Chapters 11 and 12 **Performance Check**

Excursions 11-1 thru 12-1 **Summary Table**

Objective Number	**Objective Description**
06-Core-1	Tells what is to be done with used reagents
06-Core-2	Selects the type of particle in an element that is not attracted to a charged electrode
06-Core-3	Names the charge on an ion moving toward an electrode with a known charge
06-Core-4	Explains how rubbing produces a charge in neutral objects
06-Core-5	States the relationship of charges on objects which have been rubbed together
06-Core-6	Selects a description of the charges on positively and negatively charged objects
06-Core-7	Explains how neutral objects become charged when rubbed together
06-Core-8	Selects a description of the charges on a neutral object
06-Core-9	Recognizes types of charges that neutral objects are attracted to
06-Core-10	Explains the actions of a neutral and a charged object which are brought together
06-Core-11	Defines operationally *neutrally charged particle of a powder*
06-Core-12	Selects the properties used to identify substances as being made of ions, identical atoms,
	or identical molecules
06-Core-13	Selects possible breakdown products of large molecules
06-Core-14	Relates the attraction of a substance to a charged object to whether the substance is ionic
	or molecular
06-Core-15	States and explains what holds the neutral atoms in a neutral molecule together
06-Core-16	States the term for substances composed of several elements

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				applies	
				Q						classifies	
				Q		√				applies	
						√				applies	
						√				applies	
				Q		√				classifies	
						√				applies	
				Q		√				classifies	
				Q						applies	
									√	generates	
										generates	
				Q					√	classifies	
				Q					√	classifies	
						√				applies	
						√				applies	
				Q		√				classifies	

Objective Number	Objective Description
06-Core-17	Recognizes a description of an ion
06-Core-18	Selects correct descriptions of the charge properties of molecules
06-Core-19	Selects an assumption of the atomic model of matter
06-Core-20	Recognizes the continuous development of scientific models
06-Core-21	Indicates what it means for scientists to accept a model
06-Core-22	Selects the reason scientists accept a model
06-Core-23	Selects from a list particles having electrical charge
06-Core-24	Recognizes certain properties as characteristic of atoms or of ions
06-Core-25	Decides whether matter is ionic or molecular on the basis of its reaction to charges
06-Exc 11-1-1	States whether or not water is an element and why
06-Exc 11-2-1	Judges the validity of a conclusion about a charge, based on attraction to a single charged strip
06-Exc 11-3-1	Selects a graph whose slope agrees with the data
06-Exc 12-1-1	Selects the sketch showing the atoms combined according to their specified combining power
06-Exc 12-1-2	Draws an isomer from a given structural formula
06-Exc 12-1-3	Recognizes the relationship between structural isomers and properties
01-Core-24 thru 28R	(Student's responsibilities)

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		✓				classifies	
				Q		✓				classifies	
				Q		✓				classifies	
						✓				applies	
				Q		✓				applies	
				Q		✓				applies	
				Q						classifies	
				Q						classifies	
				Q						classifies	
										classifies	
										applies	
				Q						classifies	
				Q					✓	applies	
				Q					✓	applies	
									✓	applies	
		O				✓				chooses	

Objective Number	Objective Description
03-Core-2R	States the term for substances made up of a single kind of atom
04-Core-10R	Recognizes the makeup of compounds
04-Core-14R	Recognizes the limitations of model acceptance
05-Core-1R	States the purpose of a control in an experiment
05-Core-14R	States the importance of operational definitions
05-Core-16R	Names the force holding matter together
05-Core-21R	States whether scientists consider models to be tentative or definite
05-Core-23R	States whether or not ions are models

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		✓				recalls	
				Q		✓				classifies	
				Q		✓				applies	
						✓				applies	
						✓				applies	
				Q		✓				applies	
				Q		✓				applies	
				Q		✓				applies	

06 Core 1

Tells what is to be done with used reagents.

The student applies the rule for handling an excess of reagents taken from stock bottles.

Student Action: Stating that unused reagents are never put back into the reagent bottles because they might be contaminated or be put into the wrong bottle, thereby contaminating it.

Performance Check A: In Chapter 11 you put some sodium chloride solution into a beaker. You then tested it to see if it conducted electricity. When you finished, you put the solution into the "used" jar. Why didn't you just put the solution back into the jar it came from, since you didn't add any other chemicals to it?

Remediation: (1) Ask the student if all equipment is absolutely clean – no water spots on glassware, never any chemical powder on desk tops, and so forth. (2) Ask a series of "what if" questions aimed at possible contamination.

06 Core 2

Selects the type of particle in an element that is not attracted to a charged electrode.

The student classifies as atoms the particles of an element in a solution which are not attracted to either electrode.

Student Action: Selecting the term *atoms.*

A: a
B: b
C: b

Performance Check A: Mike had a solution which contained particles of an element. He put a positively and a negatively charged rod into the solution. The particles of the element were not attracted to either of the rods. Which of the following kinds of particles of the element are in the solution?

a. Atoms
b. Ions
c. Either a or b
d. None of the above

Remediation: (1) If the student chose "ions," ask him to review Figure 11-2 on page 160 and the paragraph at the top of page 161. Then ask him to explain his answer. (2) Review page 59 to establish the relationship between elements and atoms. (3) Review page 188, point 7. If the student marked none of these, emphasize the particleness of all matter.

06

Names the charge on an ion moving toward an electrode with a known charge.

The student applies the concept that an ion moves towards an electrode whose charge is opposite to that of the charge on the ion.

Core 3

Student Action: Stating the charge of the ion.

- **A:** Positive
- **B:** Positive
- **C:** Negative

Performance Check A: Larry put two carbon rods, which were connected to a battery charger, into a solution of nickel nitrate. The nickel ions moved toward the rod with the negative charge. What was the charge on the nickel ions?

Remediation: (1) Review the student's answers to question 10-1 and then extrapolate to ions and rods. (2) Review Figure 11-1 and the paragraphs below it on page 160.

---

06 Core 4

Explains how rubbing produces a charge in neutral objects.

The student applies the concept of how neutral objects become charged when rubbed.

Student Action: Responding that neutral objects can either gain or lose charges (negative) when rubbed, thus producing a charge on the rubbed objects.

Performance Check A: Jack wiped his uncharged shoe on an uncharged wool rug. His shoe and the rug became charged. Explain what happens to cause the two neutral objects to become charged by being rubbed together.

Remediation: Review the paragraphs at the bottom of page 166 and on pages 167 and 168.

---

06 Core 5

States the relationship of charges on objects which have been rubbed together.

The student applies the rules that if charges are produced on objects which are rubbed together, the charges are opposite to each other and that like charges repel and unlike charges attract.

Student Action: Responding that the two objects will attract each other because rubbing the two objects together produces opposite charges on them which causes them to attract each other.

Performance Check A: Jan charged a rubber rod by rubbing it with a piece of tissue paper. She then brought the rubber rod close to the tissue paper.

1. Will the rod and the paper attract or repel each other?
2. Why?

Remediation: (1) Have the student bring a piece of acetate strip and a tissue together and bring them near to each other again. Ask if they are charged alike or differently after rubbing. (2) Review the bottom half of page 166 through the top half of page 168.

06 Core 6

Selects a description of the charges on positively and negatively charged objects.

The student classifies the distribution of charges on charged objects.

Student Action: Selecting the description that indicates the notion that positively and negatively charged objects have an excess of positive and negative charges respectively.

A: Case 1. c
Case 2. b
B: Case 1. d
Case 2. a
C: Case 1. b
Case 2. d

Performance Check A: Write the letter of the best answer in each of the following cases.

Case 1. If a plastic comb has a positive charge, it has
- a. as many negative as positive charges.
- b. fewer positive charges than negative charges.
- c. fewer negative charges than positive charges.
- d. just positive charges.

Case 2. If a rubber comb has a negative charge, it has
- a. fewer negative charges than positive charges.
- b. more negative charges than positive charges.
- c. just negative charges.
- d. as many positive charges as negative charges.

Remediation: (1) Review pages 166 through 168, with particular attention to page 168. (2) Check the student's responses to Self-Evaluations 11-3 and 11-4.

06 Core 7

Explains how neutral objects become charged when rubbed together.

The student applies the concepts of how neutral objects become charged by being rubbed together.

Student Action: Responding with the notion that neutral objects have equal numbers of positive and negative charges and that when they are rubbed together, they become oppositely charged because negative charges are removed from the surface of one, leaving that object positive, and adhere to the surface of the other, making it negative.

Performance Check A: Jack noticed that when he rubbed a neutral rubber rod and a neutral piece of rabbit's fur together, they became oppositely charged. Explain how opposite charges were produced by rubbing two objects together which had been neutrally charged.

Remediation: (1) Review pages 167 and 168. (2) Check the student's answer to Self-Evaluation 11-7.

06 Core 8

Selects a description of the charges on a neutral object.

The student classifies the ratio of positive and negative charges on neutral objects.

Student Action: Selecting the statement to the effect that neutral objects have an equal number of positive and negative charges.

A: d
B: a
C: b

Performance Check A: Record the letter of the phrase below which correctly completes the sentence. A neutral object has

a. no positive or negative charges.
b. fewer negative than positive charges.
c. more negative than positive charges.
d. equal numbers of positive and negative charges.

Remediation: (1) Review the paragraph at the top of page 169 and discuss the charges in the neutral objects in Figure 11-4. (2) Also discuss how the neutral and charged objects differ and how they are alike. (3) To summarize, ask the student how an object can be neutral and yet contain charges. (4) Check the student's response to Self-Evaluation 11-6.

06 Core 9

Recognizes types of charges that neutral objects are attracted to.

The student applies the concept that a neutral object is attracted to objects with either a positive or a negative charge.

Student Action: Stating that the charge on object X is neutral.

Performance Check A: Donna hung a Ping-Pong ball from a piece of string. She found that two rods, one a positively charged rubber rod and the other a negatively charged glass rod, attracted the ball. What was the charge on the ball?

Remediation: Review the material after Figure 11-9 on page 171, and review all of page 172.

06 Core 10

Explains the actions of a neutral and a charged object which are brought together.

The student generates an explanation for the actions of a charged and a neutral object which are brought into contact with each other.

Student Action: Responding to the effect that the neutral object has equal numbers of positive or negative charges and at first the charged object attracts the opposite charges on the neutral object; thus, one side of each object is attracted to the other object, and when they come together, the excess charge of the charged object is split with the neutral object, the neutral object becomes similarly charged, after which they have like charges and repel each other.

Performance Check A: Jim had two Ping-Pong balls. He knew that ball A was neutrally charged and ball B had a negative charge. When he found that balls A and B attracted each other, he allowed them to touch. After a few seconds, the balls began to repel each other and continued to repel. Explain why they first attracted and then repelled each other.

Remediation: (1) Review page 171 through page 173. (2) Check the student's response to Self-Evaluation 11-8.

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06 Core 11

Defines operationally *neutrally charged particle of a powder.*

The student generates the operational definition of *neutrally charged particle of a powder.*

Student Action: Stating that a neutrally charged particle of a powder is a particle which is attracted both to positively and to negatively charged objects. The definition that a neutrally charged crystal has the same number of positive and negative charges is unacceptable because it is not an operational definition.

Performance Check A: Give an operational definition for *neutrally charged particle of a powder.*

Remediation: (1) Review the concept of defining operationally as answering how you can tell if you have some. (2) Have the student review pages 171 through 173, and then answer the question again. (3) Ask him if his answer fits only a neutral object. Would an object with a charge react differently?

---

06 Core 12

Selects the properties used to identify substances as being made of ions, identical atoms, or identical molecules.

The student classifies the properties by which he can determine whether a substance is made of ions, identical atoms, or identical molecules.

Student Action: Selecting the items which refer to the property of the electrical conductivity of a solution of the substance and to the property that the substance can be broken down into two or more simpler substances.

A: c, e
B: a, d
C: a, c

Performance Check A: Suppose you were given a pink solid and asked to determine if the solid was made of ions, of one kind of atom, or of one kind of molecule. Select any of the following which you would need to know to identify the kind of particles in the solid.

a. The amount of the solid which will dissolve in water
b. The size and shape of the solid
c. If a solution of the solid will conduct electricity
d. If its powder is attracted to a negatively charged vinyl strip
e. If the solid can be broken down into two or more simpler substances

Remediation: (1) Ask the student to explain how the answers he chose would help him differentiate among atoms, ions, and molecules. (2) Review page 160 to establish the operational definition for *ions.* (3) Review pages 176 through the top of 178, particularly question 12-7 and its follow-up paragraph.

---

06 Core 13

Selects possible breakdown products of large molecules.

The student classifies smaller molecules, atoms, elements, and other compounds as possible breakdown products of a large molecule.

Student Action: Selecting the option which indicates that all the entries are correct.
A, B, and **C:** e

Performance Check A: Dr. Lee found a procedure for breaking down large starch molecules into smaller units. Which of the following is a possible product of such a breakdown?

a. Smaller molecules
b. Atoms
c. Elements
d. Other compounds (combinations of different atoms)
e. All of these

Remediation: (1) Review pages 176 through the top of 178 to establish the notion of the breakdown of molecules into atoms. (2) Review pages 182 through 184 to establish the notion of molecular breakdown into molecules. (3) Review the concepts of elements, matter made up of just one kind of atom, on page 59, and of compounds, matter made of molecules, on page 183 including the diagrams. (4) The student may not have made the connection that molecules, which are combinations of several different atoms, are compounds. If not, review pages 183 and point 6 on page 188. (5) Check the student's response to Self-Evaluations 12-1 and 12-2.

---

06 Core 14

Relates the attraction of a substance to a charged object to whether the substance is ionic or molecular.

The student applies the concept that the attraction of the particles of a substance to charged objects is irrelevant to whether that substance is ionic or molecular.

Student Action: Responding that he disagrees with the conclusion that a substance is made up of ions because in powder form it is attracted to a charged object because the attraction of the particles of a substance to charged objects is irrelevant to its being ionic or molecular.

Performance Check A: Bob found that baking soda, a powder, is attracted to both a positively charged acetate strip and a negatively charged vinyl strip. He therefore concluded that baking powder must be made up of molecules, not ions.

1. Do you agree or disagree?
2. Explain your answer.

Remediation: (1) Review Activities 11-3 through 11-5 to establish that sucrose and copper sulfate ($CuSO_4$) are both attracted to the charged strip. (2) Pages 184 and 186 establish sucrose as a molecular substance and the paragraphs before and after Figure 12-6 establish $CuSO_4$ as an ionic substance. (3) Check the student's response to Self-Evaluation 11-2. (4) Have him do an alternate check.

06 Core 15

States and explains what holds the neutral atoms in a neutral molecule together.

The student applies the concepts of matter which explain how neutral atoms in a neutral molecule are held together.

Student Action: Responding with the term *electrical force* and the essence of the concepts that all matter contains positive and negative charges and that it is the attraction of these different charges which holds neutral atoms in the molecule together.

Performance Check A: Two atoms of hydrogen and an atom of oxygen combine to form one molecule of water. It requires a great deal of force to separate the neutral atoms once they have combined.

1. What force holds the neutral molecule together?
2. Explain how this force can exist in a neutral molecule.

Remediation: (1) Review page 185 and the student's answer to question 12-21. (2) Review his response to Self-Evaluation 11-5.

06 Core 16

States the term for substances composed of several elements.

The student classifies a substance which is composed of atoms of more than one kind combined in definite numbers (ratios) as a compound.

Student Action: Responding with the term *compounds.*

Performance Check A: Salt is a substance which is made up of atoms of chlorine and atoms of sodium combined in definite numbers. What are such substances called?

Remediation: (1) Review the contents of the blue box on page 104. (2) Review part A of Excursion 12-1. (3) Review point 6 on page 188 and ask the student to review pages 176 and 177 and to report to you if sucrose is a compound and the evidence for his answer.

06 Core

Recognizes a description of an ion.

The student classifies an atom which has gained or lost a negative charge, thereby becoming a charged particle, as an ion.

Student Action: Responding with the term *ion.*

17

Performance Check A: Neutral atoms of chlorine gain negative charges from atoms of sodium and become chlorine particles with a charge. What name do scientists give to such atoms with a charge?

Remediation: The text alludes to this definition of a charged atom, but it is never stated as such. (1) Have the student review the concept of copper as an element. (See the chart on page 60.) (2) Review the concept that elements are made up of atoms, page 59. (3) Review the concept that atoms are neutral. (4) Review, on page 137, the concepts that copper-particle atoms in solution are ions and, on page 145, that ions have a charge. (5) From these concepts, the student builds the definition of *ions* as atoms with a charge.

06
Core
18

Selects correct descriptions of the charge properties of molecules.

The student classifies the properties of a molecular substance.

Student Action: Selecting all the given statements which agree with any of the following. A molecular substance

(1) contains positive and negative charges.
(2) in solution will not conduct electricity.
(3) does not contain ions.
(4) is attracted to either a positively or negatively electrostatically charged strip.
(5) is a neutral particle.

A: c, d, and e
B: b, c, and d
C: b, c, and e

Performance Check A: Cornstarch is made up of molecules. Record the letter of any of the following which are true statements about cornstarch.

a. The substance contains no positive or negative charges.
b. A solution of the substance will conduct electricity.
c. The substance contains both positive and negative charges.
d. The substance is attracted to a positively charged acetate strip.
e. The substance is attracted to a negatively charged vinyl strip.

Remediation: (1) Remind the student that glucose and sucrose are also made up of molecules. (2) Review Activities 11-3 and pages 182 through 185.

06
Core
19

Selects an assumption of the atomic model of matter.

The student classifies four statements as either congruous or incongruous with the atomic model.

Student Action: Selecting the statement that matter contains movable negative charges as congruous with the atomic model.

A: c
B: a
C: b

Performance Check A: Select the statement below which is part of the atomic model.

a. Matter contains no positive or negative charges.
b. There are billions of different kinds of matter atoms.
c. Matter contains movable negative charges.
d. There are no particles in gases.

Remediation: Have the student review his answer, referring to page 188.

---

06 Core 20

Recognizes the continuous development of scientific models.

The student applies the concept of the tentativeness of the models of science.

Student Action: Responding with disagreement because the models of science are under continuous development and refinement and are never complete.

Performance Check A: Read the following carefully. The particle model that you have developed is incomplete, but you have been working on it for less than a year. You are working toward the same completed model which scientists have already finished developing.

1. Do you agree or disagree with the statement above?
2. Why?

Remediation: Have the student read the last paragraph on page 186 and all of page 187. The model used by scientists is better developed than his, but it is still a model, and models often must be changed to include new observations. Models are always incomplete!

---

06 Core 21

Indicates what it means for scientists to accept a model.

The student applies the concept that acceptance of a model imples only that it explains observations made to date.

Student Action: Selecting the entry involving the explanation of observations.

A: c
B: a
C: d

Performance Check A: Suppose that all scientists accepted a particle model for sound. This would mean that

a. scientists had direct proof that sound exists as particles.
b. at least a few good scientists had actually seen sound particles with their own eyes.
c. thinking about sound as though it were made of tiny particles explained most of the observations made up to that time.
d. sound is exactly like matter particles.
e. no other model could explain the observations made up to that time.

Remediation: (1) Review pages 104 and 105, which summarize what the students have done so far with models. (2) Review the last paragraph of page 186 and all of page 187. (3) Finally, have the student select the correct answer and make an attempt to explain why the others are wrong.

06
Core
22

Selects the reason scientists accept a model.

The student applies the concept that models and their constructs are accepted as useful ways of thinking about phenomena.

Student Action: Selecting the response which implies that models and their constructs are accepted as useful ways of thinking about phenomena.

A: b
B: a
C: c

Performance Check A: Select the phrase which completes the sentence correctly. The atom, a particle of an element, is a model now being used to explain matter. Scientists accepted the atomic model

a. when no other model could describe the reactions of matter.
b. when thinking about matter as tiny particles proved to be useful.
c. when Congress passed a law that gravity can exist only if it is in the tiny particles described by the model.
d. only when gravitons were seen in experiments.

Remediation: (1) Reread the paragraph beginning at the bottom of page 186 and on page 187. Also review the section "The Model so Far" on pages 104 and 105. The model used by scientists is better developed than the student's model but it is nevertheless a model, and the design of models must often be changed to include new observations.

06
Core
23

Selects from a list particles having electrical charge.

The student classifies atoms, molecules, and neutral particles as having no charge (equal number of positive and negative charges) and ions as having a charge.

Student Action: Selecting the term *ion.*

A: d
B: b
C: a

Performance Check A: If you are thinking about the concept of electrical charge, which of the following terms does not belong with the other three?

a. Atoms
B. Molecules
c. Neutral particles
d. Ions

Remediation: (1) Since the student may have some rational basis for choosing one of the distractor terms, have him explain his answer and then do step 2. (2) After the student has reviewed point 7 on page 188, have him revise his answer and explain to you why he changed it.

06
Core
24

Recognizes certain properties as characteristic of atoms or of ions.

The student classifies properties as characteristics of atoms, of ions, or of both.

Student Action: Labeling correctly four of the five cases in accordance with the following:

(1) [ions] can be particles with an excess of negative charges,
(2) [ions] in solution are attracted to a rod with a charge,
(3) [atoms] are present in a piece of a specified element,
(4) [ions] are responsible for conducting current in a solution,
(5) [atoms] have equal numbers of positive and negative charges,
(6) [ions and atoms] contain positive and negative charges,
(7) [ions and atoms] can be colored, and
(8) [ions] can be particles with more positive charges than negative.

A: 1. atoms, 2. both, 3. atoms, 4. both, 5. ions
B: 1. ions, 2. ions, 3. ions, 4. both, 5. atoms
C: 1. atoms, 2. both, 3. ions, 4. ions, 5. ions

Performance Check A: On your answer sheet, beside the number of each statement, write the word *atom* for statements that are true of atoms. Write the work *ion* for the statements that are true of ions. Write the word *both* for statements that are true of both atoms and ions.

1. They are present in a piece of copper.
2. They can be colored.
3. They have an equal number of positive and negative charges.
4. They contain positive and negative charges.
5. They can be particles with more positive charges than negative.

Remediation: Use the table below to help the student review the sections he missed. The numbers in the left column indicate the points listed in the Student Action.

POINTS	REVIEW SECTIONS
1	Pages 166, 167, and 168
2	Figure 10-5, page 155
3	Pages 59 and 137
4	Page 160
5	Pages 166, 167, 185, and assumption 1 on page 173
6	Pages 167, 168, and 185
7	Have the student look at piece of copper and the color of several copper compounds. See Table 4-1 on page 43.
8	Consider the answer to question 11-19.

06
Core
25

Decides whether matter is ionic or molecular on the basis of its reaction to charges.

The student classifies as ionic substances which are attracted to both positively and negatively charged strips and whose solutions conduct electricity.

Student Action: Selecting the statement which classifies the particles as ionic and as containing equal amounts of positive and negative charges.

A: d
B: c
C: a

Performance Check A: When John tested three substances, he found that their solutions conducted electricity. When the substances were dry and powdered, they were attracted both to positively and to negatively charged acetate strips. Look at the chart of his data below.

SUBSTANCE	CONDUCTS ELECTRICITY	ATTRACTED TO POSITIVE CHARGE	ATTRACTED TO NEGATIVE CHARGE
Blue	yes	yes	yes
Brown	yes	yes	yes
Purple	yes	yes	yes

Based on these data, what can you conclude about the substances? Select the statement below which correctly describes the substances.

a. They are ionic, and each substance contains unequal amounts of positive and negative charges.
b. They are molecular, and each substance contains unequal amounts of positive and negative charges.
c. They are molecular, and each substance contains equal amounts of positive and negative charges.
d. They are ionic, and each substance contains equal amounts of positive and negative charges.

Remediation: (1) Ask the student to explain the term *ions*. If necessary, refer him to pages 159 and 160 and review question 11-4. (2) Ask him to explain *molecule*. If necessary, refer him to pages 175 and 182 and Self-Evaluation 12-3. (3) To clarify the terms *ionic* and *molecular*, see page 186. (4) To clarify *charges*, review Activities 11-3, 11-4, and 11-5 and pages 166 through 173, with particular emphasis on page 173.

06
Exc
11-1
1

States whether or not water is an element and why.

The student classifies a substance that can be broken down into two or more different substances as not being an element.

Student Action: Stating that water is not an element because it can be broken down into different substances (atoms).

Performance Check A: For many years, people thought that water was an element.

1. Is it?
2. Explain your answer.

Remediation: (1) Refer the student to page 482 and the definitions of *element* and *compound* given on page 104. (2) Ask him what water is if it is not an element, and have him explain his response.

06
Exc
11-2
1

Judges the validity of a conclusion about charge, based on attraction to a single charged strip.

The student applies the concept that oppositely and neutrally charged objects are both attracted to a charged strip.

Student Action: Stating that the conclusion that the drips had a neutral charge is poor because objects with an opposite charge, as well as neutral charge, would be attracted to a charged strip.

Performance Check A: Leroy used a shortcut in doing the excursion "Strip Affects Drip." Instead of using one vinyl and one acetate strip, he used only an acetate strip. He gave it a positive charge and held it near a stream of drips. The drips were attracted to the charged strip. Leroy concluded that the drips were neutral.

1. Was this a good conclusion?
2. Explain your answer.

Remediation: (1) Have the student review page 172. (2) Ask him to predict what would have happened if a negative particle were used in Figures 11-10 and 11-11. (3) Get him to verbalize that both neutral and oppositely charged matter are attracted to a charged rod and that the test with a single charged rod is therefore inconclusive.

06
Exc
11-3
1

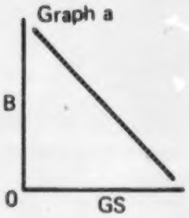
Selects a graph whose slope agrees with the data.

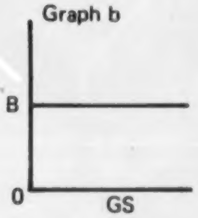
The student classifies a graph as representing a given set of data.

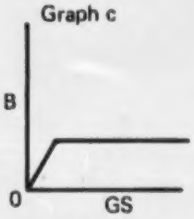
Student Action: Selecting the graph which shows a steep rise in brightness for small increases in grams of salt and then a sudden change to an almost horizontal line as the graph which represents his data for the excursion.

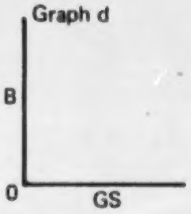
A: c
B: b
C: e

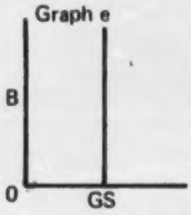
Performance Check A: You may look at your book and notes for this question. If in Excursion 11-3, "Electrolytes Light," you were to draw a graph of your data, which of the following graphs best represents the general shape you would find?











B = Brightness GS = Grams of salt

Remediation: (1) Ask the student to state whether the bulb lit when there was no salt in the water. (2) Ask him whether the brightness increased rapidly as he added a small amount of salt. (3) Did the brightness reach a point at which it stayed the same even when more salt was added? (4) With each of the graphs, have him explain what he would have seen in his experiment if the graph truly represented his data.

06
Exc
12-1
1

Selects the sketch showing the atoms combined according to their specified combining power.

The student applies the concept of the combining power of atoms.

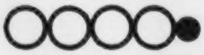
Student Action: Selecting the diagram which shows the combination of atoms which is in accordance with the specified combining power of the atoms.

A: c
B: b
C: d

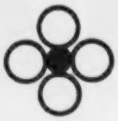
Performance Check A: Suppose you had one nitrogen atom and four chlorine atoms. If nitrogen atoms have a combining power of 3 and chlorine atoms have a combining power of 1, which of the following diagrams shows the most likely combination of these five atoms?

Key	
Nitrogen atom	●
Chlorine atom	○

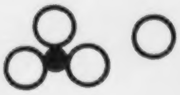
a.



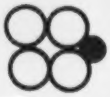
b.



c.



d.



Remediation: (1) Have the student review the definition of *combining power* on page 488 of the text. (2) Check his answer to question 9 on page 489. (3) If the student answered question 9 incorrectly, check his answers to questions 5 through 8 on pages 488 and 489 and help him to answer question 9 correctly. (4) Have him explain his correct answer to question 9. Then have him redo the check or do an alternate check.

06
Exc
12-1

Draws an isomer from a given structural formula.

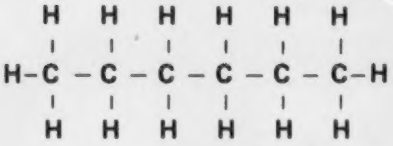
The student applies the concept that isomers contain atoms of the same kind and in the same number, arranged differently, but in agreement with each atom's combining power.

Student Action: Drawing a structural formula which shows a different arrangement of the atoms (not simply bending) and maintains the same number and kinds of atoms as those in the given formula with the same combining powers.

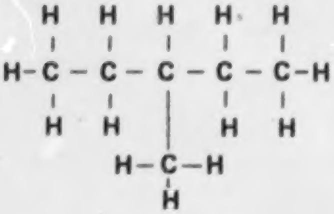
A, B, and **C:** Any one of the following which shows a different arrangement from that given in the performance check is acceptable.

2

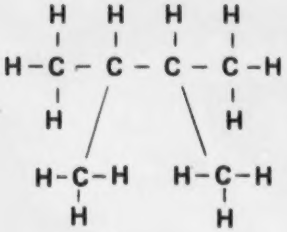
(For A, B, and C)



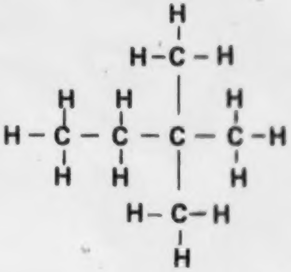
(For A, B, and C)



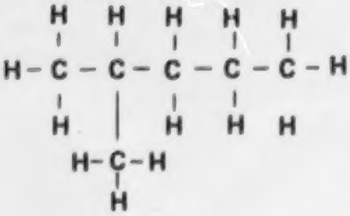
(For A, B, and C)



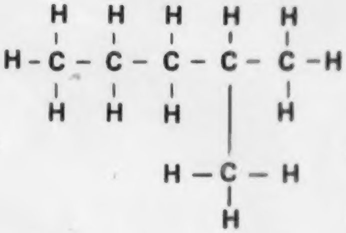
(For A and C)



(For B)



Performance Check A: Draw a structural formula for an isomer of the 6-carbon molecule shown below.



Remediation: (1) If bending presents a problem to the student, have him do the following analogous procedure. Take two pieces of string, each 20 cm long, and bend one and cut the other in half. Tie the two pieces of 10 cm string at their middles. Then, ask the student to count the ends of each string arrangement. Does the bent string arrangement have a different number of ends than a straight string? How about the rearranged string? If the ends represent places where points of contact or attraction for other molecules will occur, will the bent string arrangement be different from a straight string? Will the rearranged string be different from the bent string? (2) Have the student review the concept of isomers from the bottom of page 490 through page 491 of the textbook. (3) Check his answers to questions 15 and 16 on page 492. (4) Check his answers to questions 20 and 21 on page 493.

06
Exc
12-1
3

Recognizes the relationship between structural isomers and properties.

The student applies the concept that molecules composed of the same number and kinds of atoms which differ only in the arrangement of those atoms will have different properties.

Student Action: Responding affirmatively and explaining in effect that some compounds (isomers) have the same formula, but different properties, because their atoms are arranged differently.

Performance Check A: Both Chris and Stephanie have white powders. Each girl claims that the chemical formula for her powder is $C_4H_4O_4$. Test results for the powders are below.

	CHRIS'S POWDER	STEPHANIE'S POWDER
Melting point °C	83	139
Soluble in water	slightly	very

They repeat their tests several times to check their results.

1. Is it possible that both compounds really have the same formula?
2. Explain your answer.

Remediation: (1) Check the student's answers to questions 22 and 23 on page 497 of the textbook. (2) Suggest that he review the first paragraph on page 498.